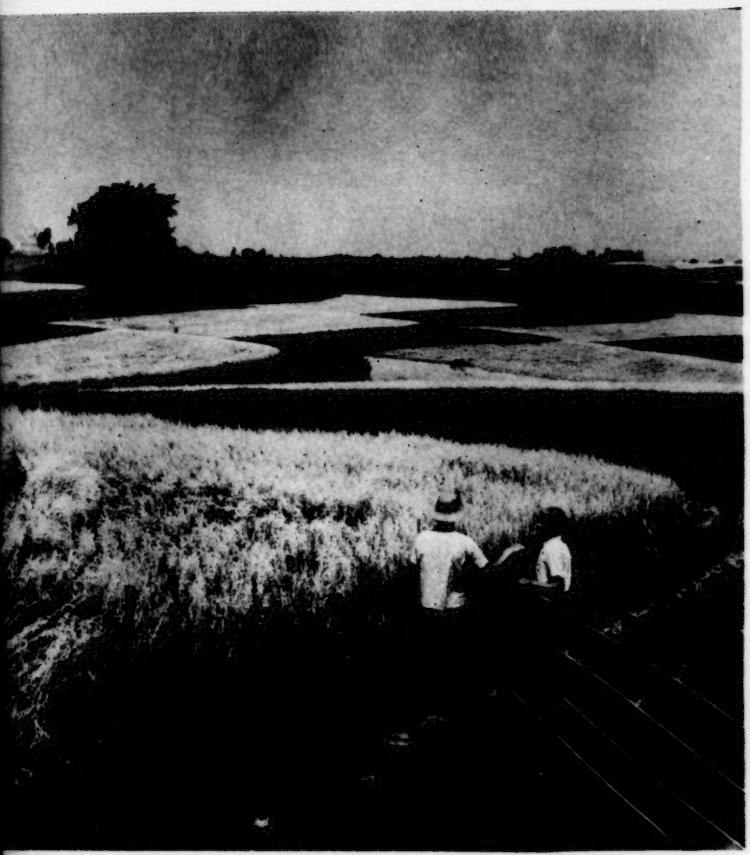

Volume 10, No. 3 May, 1955

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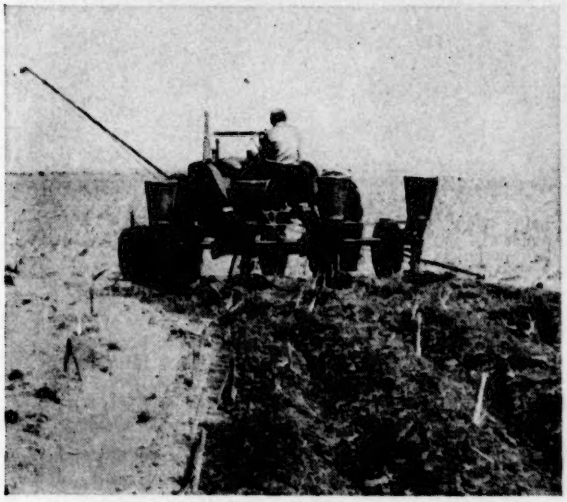

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Journal of SOIL AND WATER CONSERVATION

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NUMBER 3

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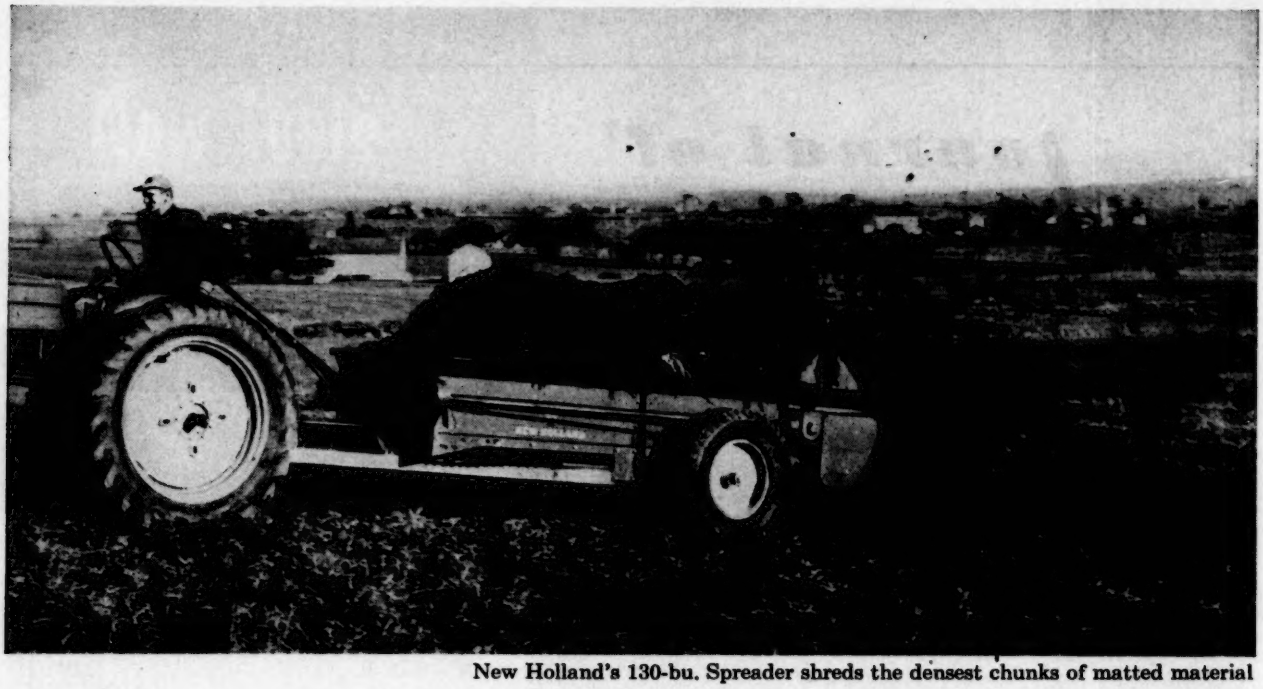

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Grassland Agriculture in the South

T. S. BUIE

In 1925 nine states east of Texas devoted 36,727,080 acres to cotton and corn and 31,381,885 acres to pasture and hay. Twenty-five years later the cotton and corn acreage had been reduced to 27,779,902 acres, whereas pasture and hay had increased to 64,890,247 acres. The trend toward grass reached its peak in 1945-50.

Pasture, hay and silage are the principal uses to which grass is being put, but many farmers are finding that a two- or three-year-old sod is excellent for row crops.

It is not anticipated that grass will replace cotton, but that the two will fit together in a complementary relationship based on current economic conditions, the capability of the land, the desires and abilities of the farmer, and related factors.

A NEW CROP has come to the South. Grass, despised by Southern farmers as a devouring enemy, and fought by them from dawn to dusk every day through many hot summers, now is challenging cotton all the way from the Carolinas to Texas.

From the standpoint of the immediate situation, this challenge does not seem as formidable as it has during more favorable seasons. Grassland farmers, along with producers of other crops, have been hard hit by the drouths of the past three summers. But this is merely one of the problems we are going to have to recognize and prepare for as we assess the long-range prospects for the new type of agriculture developing in the South.

If we are to properly evaluate the place of grass in the South today, it is necessary that we recognize the role cotton played in the economy of individuals and of the area as a whole. Otherwise, we cannot properly appreciate the significance of the shift to grass.

Cotton—King

Early in the agricultural development of the South, cotton assumed a position of dominance and for many years served—and served well—the entire nation. During the 75 years from the close of the War Between the States to the beginning of World War II this crop dominated Southern agriculture and at the same time had a marked effect on the economy of the entire country. The value of cotton exports from the United States during these years—excepting the period of World War I—almost exactly equalled our favorable trade balance.

Throughout the years many agricultural leaders, beginning even before the era of scientific agriculture brought about by the development of agricultural colleges, deplored the dependence of the Southern farmer on a one-crop system. They urged diversification—a shift to livestock and crops other than cotton. But for the most part their advice went unheeded. Good though it was, and

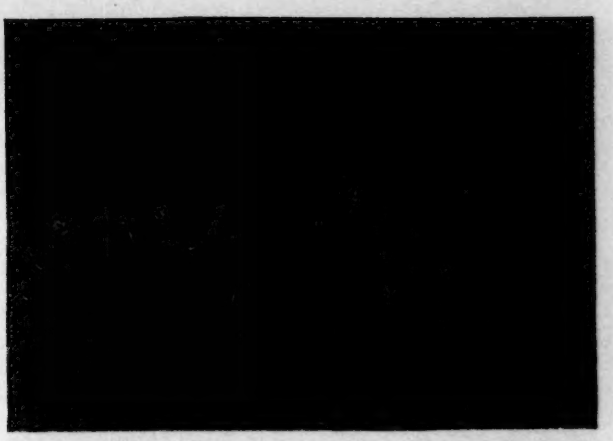

Figure 1. Coastal Bermuda grass is used extensively in the South. This grass is generally considered as a newcomer.

recognized as such by many farmers, it was unheeded largely because there was no ready market for products other than cotton and the seemingly ever-increasing demand for this crop caused it to over-shadow all others. And the abundance of labor, mostly unskilled, made a shift to other less labor-consuming activities inadvisable. Then, too, the Southern farmer until recently was handicapped in turning to grassland agriculture because of the absence of productive grasses adapted to the hot summers of the South. All conditions favored cotton, and cotton was grown.

Under prevailing conditions the South could not compete with the Western Prairies in the production of livestock, even though in the early days of our country the Southeast was an important source of meat for the more densely populated areas to the North.

The scope of the current movement toward grassland agriculture in the South is too broad to be presented properly through the viewpoint of any one individual. Therefore—and in recognition of this need—recently I addressed a brief questionnaire to a relatively large number of agricultural workers in the 11 states extending from North Carolina to Oklahoma and Texas, in which their viewpoints were sought. The response to this request was

This paper by Dr. T. S. Buie, a past president of the SCSA, was presented at the Ninth Annual Meeting of the Soil Conservation Society of America, November 15-17, 1954, Jacksonville, Florida. *Dr. Buie is state conservationist, Soil Conservation Service, Columbia, S. C.*

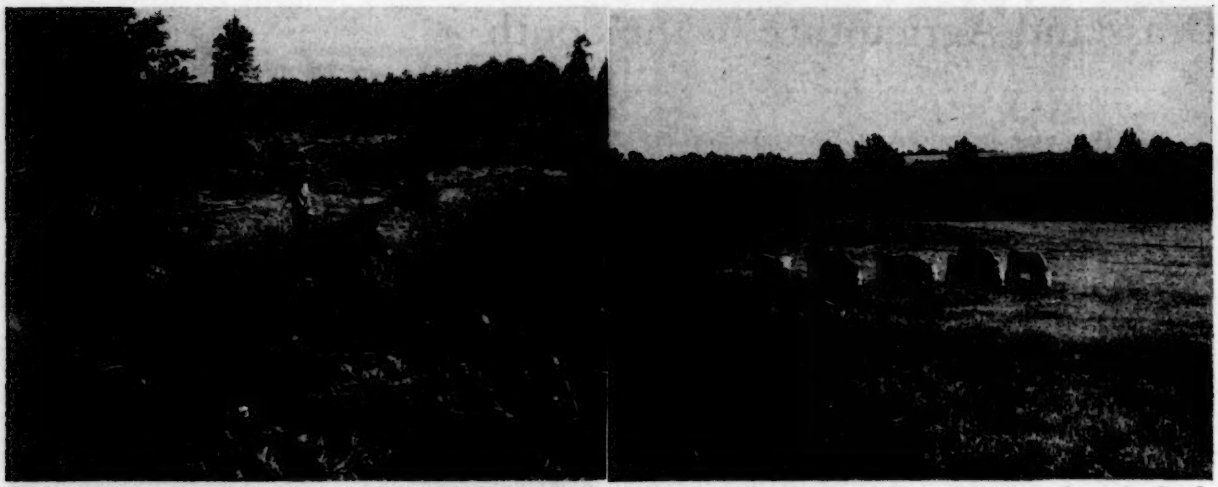

Figure 2. *Left:* Thousands of acres of unprofitable land such as this are being developed for pasture throughout the South. *Right:* Former cotton land in South Carolina now devoted to sericea for beef cattle.

indeed gratifying, as replies were received from most of those addressed. Their tabulated answers form the basis of the conclusions which are presented in this discussion.

Beginning of Grassland Agriculture

The trend toward grass in the South actually had its beginnings in the 1920's. The shortage of labor during and immediately after World War I was probably the most important factor in this movement. The decline in the price of cotton following the war, spread of the boll weevil throughout the entire cotton territory, and the greater demand for livestock products—particularly from our own people in the South—also contributed to the movement. The effect of soil depletion and erosion, although important, resulted in the abandonment of land for row crops rather than in its diversion to other uses.

But the trend toward grass which had its beginning in the 1920's did not advance very far in the 1930's. Cotton continued to be the mainstay of Southern agriculture. It was not until the labor supply was curtailed and the demand for livestock products increased greatly as the effects of World War II became evident, that our farmers began in earnest to develop pastures and feed crops.

There are three kinds of land on which grass has been and is being extensively planted in the South. *First, a substantial acreage of row crops has been directly replaced by grass for hay, pasture or seed.* But nothing like all of the land now being devoted to grassland agriculture, or which in the future may be so used, falls in this category. Thousands of acres lay idle for many years before being planted to grass. Because of severe soil erosion, the lack of labor, the low price of cotton, or a combination of these, many fields were "turned out"—as we say in the South—to broomsedge and slowly-appearing pine trees. And then much of the bottomland which is found alongside all streams of the hilly portions of the South is being cleared and used for pasture and hay. Some of these areas have never been cultivated, or if so, were long since abandoned to brush and unprofitable hardwoods. It was virtually impossible to clear such land with hand tools and horse-drawn equipment. But with the availability of tractors and bulldozers, many thousands of acres of such land on which heretofore virtually nothing of value was being produced are being brought into profitable production.

Coincident with the expansion of grassland agriculture in the South, and actually a leading factor in the movement, has been the recognition of the need for better land use practices. The planting of badly eroded idle land or the poorly drained low-lying areas just referred to, are examples of this. On-the-ground technical assistance to soil conservation district cooperators and other farmers has been an important factor in helping them to develop and maintain better land use practices. Much of the land previously planted to row crops was not suited to such a purpose and now with new plants, necessary equipment, and a growing appreciation of proper land use, farmers are in a better position to adapt their crops to the land, recognizing the capabilities of both the land and the crop and fitting them together with good management for maximum production.

New Plants

Plant explorers searching throughout the world for new material and plant breeders using native or introduced stock have been responsible in recent years for bringing into productive use many plants suited to grassland agriculture and adapted to the climatic and soils conditions of the South. Agronomists, soil conservationsts and other agricultural workers have brought these new grasses and legumes to the attention of farmers and in other cases have helped them to use to better advantage plants pre-

viously well known. For instance, common Bermuda grass is being managed so as to produce meat and milk profitably.

The former nursery program of the Soil Conservation Service, whereby seeds and planting stock of newly introduced or developed crops were increased for distribution through soil conservation districts, was an important factor in expanding the use of such plants as Kentucky-31 fescue, sericea lespedeza, blue lupine and the Bahia grasses. These are but a few of the crops which have found their way to many farms by this route.

Throughout the years a substantial amount of research on grassland agriculture has been conducted by USDA and experiment station workers of the South, but they have paid nothing like as much attention to grasses and legumes as to the more popular row crops. Honesty compels me to admit being a party to such action. I use the word "admit" advisedly, as I once was an agronomist, but like most of my colleagues of the time, I was primarily interested in cotton and not very much concerned about grass. Well do I recall the discussions with my fellow-agronomists during the 1920's when our interest was centered almost wholly on cotton, and it was only with an indifferent attitude that we even discussed pastures at all.

The exact date of the beginning of the development of a research program with grasses and legumes is difficult to determine at this time. Undoubtedly, there were various tests of one kind or another in the early days of many of our experiment stations, but for the most part no worthwhile thorough-going research in breeding better varieties, development of improved cultural methods, or the use of fertilizer for pasture was undertaken by very many experiment stations until 1930, and the date was even later in most cases.

Replies to the questionnaire, distributed throughout the South, listed a total of approximately 40 different species of grasses and legumes as being in more or less general use at this time. It is interesting to note that approximately one-half of these were unknown, at least in areas where they are now extensively grown, no more than 20 years ago. In addition to our old standbys, such as annual lespedeza, Dallis and Bermuda grass, and crimson and white clover, there are a number of newcomers in the list. Numerous crops which a few years ago were either unknown or unused in the South, but which today are planted extensively, include *the tall fescues, Coastal Bermuda, Bahia, sericea lespedeza, kudzu, Caley peas, ladino clover and many others.*

Figure 3. *Top:* Bahia grass, another newcomer, is a promising soil saving pasture plant in the South. *Bottom:* Dallis grass is one of the good pasture grasses now used on rich, heavy soils.

Some New Problems

The development of grassland agriculture in the South is resulting in many new problems. These are varied and embrace such diverse subjects as control of diseases and insects, the application of fertilizer, weed control in pastures and hay fields, and adaptation of farm equipment.

Let us consider equipment: Certain implements are needed for preparation of land for grass, others for its management and harvest, and still others in the preparation of seedbeds in sod land for following crops. No longer

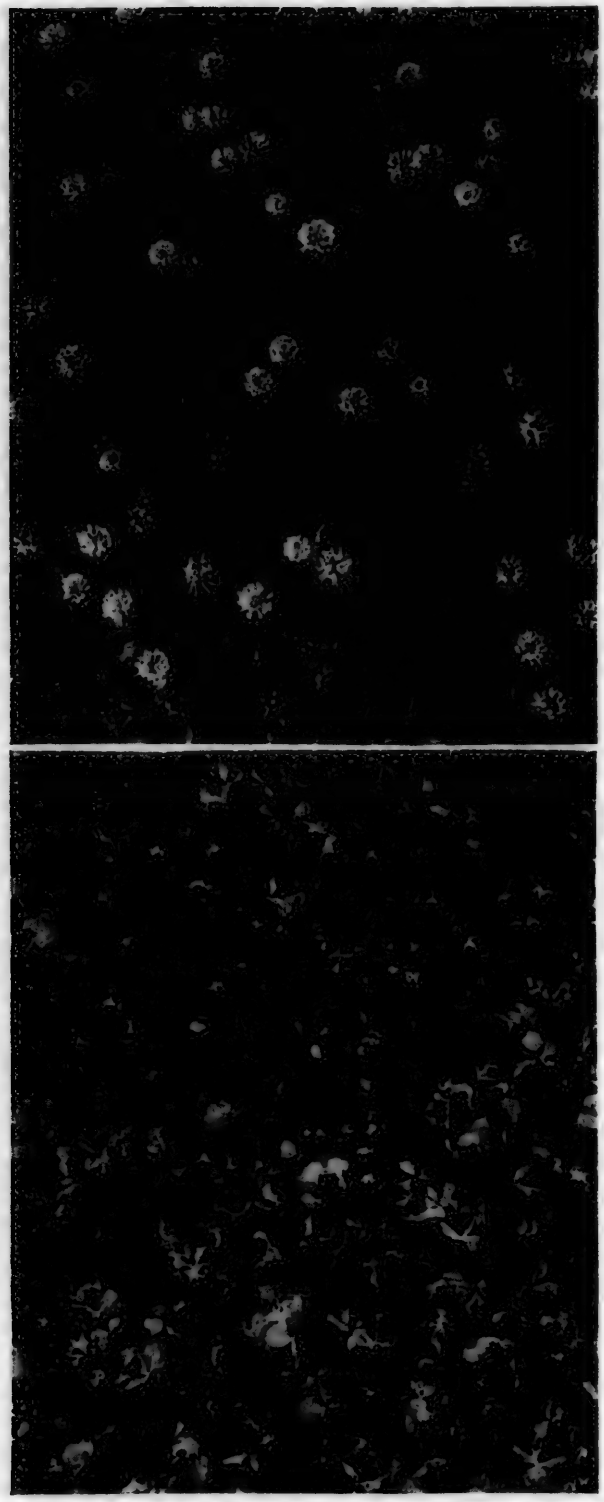

Figure 4. *Top:* Ladino clover was unknown to the South until a few years ago. *Bottom:* Crimson clover is an old standby and is used extensively.

is the one-horse plow with a few simple attachments and a combination planter and fertilizer distributor sufficient to meet the equipment needs of farmers who use grass and legumes as an important part of their farming operations. Mechanical planters which set plants or stolons at a fast rate also are in general use in many sections.

Another very important development is in the use of mechanical equipment in the preparation of sod land for succeeding crops. Tractor-drawn equipment now available on virtually every farm throughout the South makes it possible to prepare firm seedbeds even in heavy sod. Such a practice was almost impossible with mule-drawn plows and harrows, and even where it could be done, the amount of labor involved made it wholly impracticable. Thus, we see that the use of tractor equipment by the Southern farmer is playing an important part both in the establishment of grass and in its proper utilization.

Many changes and developments likewise have been made in the application of fertilizer. Where agricultural workers of a generation ago advised the use of 500 to 800 pounds of complete fertilizer per acre for cash crops such as cotton and tobacco, farmers now are using this much and more—with substantial amounts of additional nitrogen—for grass. And such applications are profitable, too, as research and experience with Coastal Bermuda and other pasture grasses and legumes show that they respond to high rates of fertilization. In many cases farmers are securing at least a part of the nitrogen needed by the grass through over-planted winter legumes.

We might discuss in like manner the problem of disease, insect and weed control introduced by grassland agriculture, as the solution of these problems has made it necessary for our farmers to develop and put to use a whole series of new skills.

Uses for Grass

Production of feed for livestock in pasture, hay and silage lead in the uses to which grassland is being put. In many cases hay or silage is secured from pasture when the growth exceeds immediate needs. A considerable number of farmers have found seed production of newly introduced crops to be highly profitable and there will always be a demand for high quality grass and legume seed of adapted crops.

Heretofore, farmers of the South have felt that there was no use to which grass could be put except as feed for animals. But farmers in all the Southern states are now planting grass as a part of their regular rotations. This is not general as yet, but approximately one-half of the individuals who answered the questionnaire recognized this use. Farmers are fast finding through experience that the best place to plant cotton, corn, tobacco, peanuts and other row crops in anticipation of bumper yields is in a field which has been in sod for two, three or more years.

Figure 5. *Left:* Fescue and ladino sod increased yield of cotton on this Mississippi farm 50 per cent. *Right:* Blue grass, carpet grass, white Dutch Clover and annual lespedeza combine to provide excellent grazing on this Florida pasture.

For instance, more than a few farmers of the Bright Leaf Tobacco Belt of the Carolinas and Georgia are finding that grass properly handled has a place in the tobacco rotation.

Grass has many advantages when thus used in a rotation. First, it protects and conserves the soil and available plant nutrients while it is growing. When it decomposes, organic matter of high quality is added to the soil. Not the least of the benefits is the improvement in the structure of the soil and the increase in its water-holding capacity. During the past season, which has been extremely dry, numerous examples have been noted where the effect of the drouth was less pronounced on row crops which followed heavy grass sod. More experimental work and demonstration are urgently needed in this field.

The Agricultural Conservation Program Service of the USDA reports that farmers of the 11 states embraced in the cotton South who cooperated with its current and former programs from 1936 to 1953 planted a grand total of approximately 170 million acres in green manure and cover crops for soil improvement and erosion control. This gives us some indication of the extent to which farmers have used and are continuing to use such crops for soil improvement.

Great Change to Date

Those of us who are familiar with Southern agriculture know and understand the tremendous change in land use which has taken place on many individual farms during the past 20 to 25 years. Not too many years ago, row crops were considered irreplaceable and the size of every farm was reckoned by the number of acres of cotton, tobacco or peanuts. Now, however, it is not unusual to find farms on which the acreage of row crops has been reduced almost, if not quite, to the vanishing point.

That with which we are familiar on individual farms is reflected in area-wide figures. In 1925 the nine states east of Texas planted 36,727,080 acres to cotton and corn. But 25 years later this acreage had been reduced approximately one-fourth or to 27,779,902. During the same 25-year period the area devoted to pasture and hay in these nine states increased from 31,381,885 to 64,890,247, or more than double. Inasmuch as the increase in grass was almost 34 million acres, while the decrease in row crops was only nine million, it is obvious that much grass was planted on land which in 1925, at least, was not devoted to the two row crops mentioned.

It is well known, of course, that World War II, with the accompanying tremendous increase in demand for animal products, was a big factor in the increased acreage of grassland in the South. In fact the movement, although it began some years earlier, did not actually get under way until about this time. The consensus of those agricultural leaders interviewed through my questionnaire was that the five-year period of greatest expansion was from 1946 to 1950. This time interval may not be quite right for all states, but South-wide it is probably as accurate a period as can be determined. We all know that immediately following the war there was a rush on the part of many people to go into livestock farming. This boom, for it was nothing more nor less, has slacked off during the past four or five years, but that may be best, for gradual, stable development is much more desirable than a rush on the part of many people to do something all at once.

What of the Future?

What we are looking forward to in the South today is the development of a sound agricultural economy, one which will spread our base of operations to a number of crops where grass plays its part. The countless gullied

hillsides and depleted fields so often seen even yet as one travels across the country bear mute testimony to the fact that we cannot build a permanent agriculture on row crops alone. We must have the diversification of which the leaders of another day dreamed and talked. There is no better way in which this situation can be created than through the more extensive use of grass and legumes adapted to local land capabilities.

Why should we not greatly increase the number of acres in grass? We have land which we are not putting to profitable use otherwise, we have the plants, we have the agricultural leadership and knowledge to develop proper methods of production and use, and we have people who are learning the mechanics of grass production, and who also are coming to have an appreciation of its place in the general scheme.

The South is concerned not with an agricultural economy in which grass will replace cotton, but one which will embrace both grass and cotton — each occupying its proper place in our pattern of a permanent agriculture.

Probably the greatest bar to increased acreage of grass in the South at this time is the cost of establishment in relation to anticipated returns. It takes quite a sum of money to develop even a few acres of pasture when that development includes clearing, land preparation, liming, fertilizing and seeding. And then there are many operations and management problems, such as ways to combat the frequent drouths, need for knowledge of better fertilizer practices, and the availability of adapted crops. The farmer himself must learn how to enter into the new activities. For instance, he must learn that to have enough feed he must at times have a surplus. There is an ever-present tendency to overstock. Acreage needed must be based on average, or even below average, conditions rather than on anticipated production when everything goes right. The effect of the severe drouth such as occurred throughout a large part of the South the past season would have been less drastic had the number of animals on our farms been in balance with normal feed production.

Will the trend toward grassland agriculture continue unabated, subject only to economic conditions and market needs? This is a question which farmers and others are asking, not only throughout the South, but the entire country. I doubt if any one can answer that question with assurance at this time, but I believe that the comment of a Mississippi farmer a few years ago is indicative of the thinking of many. He had converted his entire farm to grass, and when asked if the price of cattle declined would he continue to produce livestock or go back to cotton, he said, after a moment's thought, *"Well, I don't know just what I would do under such conditions, but whatever I decide to do with my land it will be in better condition for me to do it."*

This is the keynote and the basis of what we are doing in grassland agriculture in the South today. We are using our land and other resources more effectively than ever before. Meanwhile our soil is being put in a condition that will enable us to continue to use it in the years to come for the best purpose.

Most of the agricultural leaders of the South who were queried regarding the prospect of future expansion of grassland agriculture were optimistic. Only a very few expressed the feeling that the future regarding grassland agriculture in this section was not bright. Dr. C. C. Murray, dean and director of the College of Agriculture, University of Georgia, probably expressed the opinion of a majority when he said, *"We have the potential for great expansion. As fewer people are employed on the farm our system of agriculture in the South will become more extensive and less intensive."* Others used such terms as *"very promising," "here to stay," "further expansion anticipated,"* in commenting on the subject.

It is not to be expected that grassland agriculture will entirely, or even largely, replace cotton throughout the South, but that the two will fit together in a complementary relationship based on current economic conditions, the capability of the land, the desires and abilities of the farmer, and related factors. Within the range of economic conditions, land best suited to cotton, tobacco or peanuts still will be planted to such crops. Grass or grass and legume mixtures will be seeded on land—the capability of which makes such use logical and proper. There is plenty of land on which we can raise all the cotton we need and still have lots left for grass.

Definition of a Profession

First, a profession is an occupation for which the necessary preliminary training is intellectual in character, involving knowledge and to some extent learning, as distinguished from mere skill.

Second, it is an occupation which is pursued largely for others and not merely for oneself.

Third, it is an occupation in which the amount of financial return is not the accepted measure of success.

—The late Justice Brandeis
U. S. Supreme Court

Trees for Tomorrow

M. N. TAYLOR

In this business of growing trees, we are limited by three things: Soil, moisture and the mean average temperature. Soil, of course, is the most important as it governs the species of trees which may be grown in a given area. Soil itself is affected by erosion which again can be controlled by the planting of trees and grasses. Soil, in certain areas such as the low delta lands, may also be affected by the silt deposits arising from floods. Again, trees play an important part in flood control. They slow up the rate of run-off of water in the hilly and mountainous areas, thus helping to equalize the flow of water in the streams.

—D. C. Everest

THE DEVELOPMENT OF THIS integrated idea by Trees for Tomorrow, as envisioned by Mr. Everest, is a good example of an industrial approach to resource management. When found in 1944, Trees for Tomorrow was concerned primarily with the planting of trees. However, during the first five years, two factors became obvious as our contact with people expanded. These factors are:

- That soil, water, forest and wildlife management are an integral part of a complex over-all resource picture.
- That people follow through *more thoroughly* if they have invested their own time, money or effort in a project.

Now launched in its twelfth year, the Trees for Tomorrow program revolves around:

1. The distribution of one-half million free trees annually.
2. The machine planting of 750,000 trees which landowners buy from state nurseries.
3. The preparation of forest management plans for privately owned woodlands.
4. A large scale and cooperative program of resource education.

For practical purposes you can interest more people in the planting of more trees if you also appeal to their interest in soil, water and wildlife. The same results can be accomplished by including the importance of forestry and water conservation when stressing soils. Building an understanding of this basic concept is paramount to the success of any over-all resource management plan.

The Trees for Tomorrow program is based on the idea that contact with people comes first, that action is more important than any other media in helping to build the resources of the state. *Trees for Tomorrow is sponsored by 13 paper mills and five power companies, representing the bulk of the paper and power producing capacity of Wisconsin. The paper and power industries are vitally interested in a sustained flow of forest products, watershed protection, and in the prevention of floods and the silting of dams because these things are sound business.*

M. N. Taylor is executive director of Trees for Tomorrow, Inc. His headquarters are at Merrill, Wisconsin.

Helping People to Help Themselves

This spring Trees for Tomorrow will distribute 550,000 trees to 570 different private landowners. It is not the intent of this distribution plan to furnish planting stock to the same landowners year after year. Free trees are offered in the amount of 1,000 seedlings per year for a period of two years. During this time, Trees for Tomorrow foresters have an opportunity to check planting sites, make survival counts, and to become acquainted with the landowner. After the second year, we forward each landowner a tree application blank from the state and a letter encouraging him to carry on his reforestation program through the purchase of trees from state nurseries. Each state application blank carries a symbol by which we can determine the carry-over effect. We have found that while we distribute approximately one-half million trees, landowners, as a result of receiving free planting stock in the past, are buying a million and a half trees each year.

Figure 1. W. A. Sylvester, left, Trees for Tomorrow forester, takes time out at a tree distribution center to explain techniques of planting spruce to an attentive youngster. Each spring a half million trees are distributed free to landowners from 14 north central Wisconsin counties on the basis of 1,000 trees per year for a period of two years.

Figure 2. *Left:* I. O. Hembre, secretary of Wisconsin State Soil Conservation Committee and a member of Trees for Tomorrow camp advisory council, instructing teachers how to take a soil profile on a field tour from the camp. Teachers earn six credits during a five weeks' course each summer sponsored by Wisconsin State colleges. *Right:* Trees for Tomorrow operates three tree planting machines for large scale reforestation. Under this plan, planting stock is purchased from the state and the landowner pays Trees for Tomorrow $3 an hour for the use of the machine. Fifteen banks in north central Wisconsin have bought machines and turned them over to county agents for the use of landowners in the area.

As a direct result of our contact with landowners in the distribution of free trees, Trees for Tomorrow now operates three tree planting machines for large scale reforestation. This can be done at about one-half the cost of hand planting.

Under the machine planting plan, landowners buy their stock from the state, furnish a tractor and labor, and pay Trees for Tomorrow $3 an hour for the use of the machine. Trees for Tomorrow in turn checks planting sites, prepares a planting plan, furnishes the technical assistance of a forester, and routes the trees from a nursery to the landowner.

Management and Resource Education Important

It was natural that a program of forest management should develop as a result of our extensive contacts with landowners in the planting of trees. Forest management is important because of the 16,000,000 acres of commercial forest land in Wisconsin of which about 14,000,000 acres require some degree of management.

Since the fall of 1953, a small fee of 10 cents an acre has been charged for the preparation of these plans. During the past year, management plans have been prepared for 16,780 acres of privately owned woodlands. Besides a reconnaissance map, these plans include a written supplement containing an inventory of present cover types, giving age and size classification, recommendations for tree planting and harvesting, as well as a summary of the probable status of the tract 10 or 15 years from now.

The importance of soil, forest, water and wildlife management is dramatized annually to 3,600 people who attend conservation workshops at the Trees for Tomorrow Camp. Of this number, 1,500 are high school and county normal school students who come to camp on school time. Workshops vary in length from three days to an accredited five-weeks' course for teachers sponsored by Wisconsin State colleges. Fifty-nine coordinators, top-flight specialists in resource education, and 49 field technicians made up the corps of the instruction staff. The Trees for Tomorrow Camp maintains a camp director and a forester at Eagle River year around.

The camp opened this year on March 6 and will continue with a full schedule until November 5. There are 125 different resource tour stops from Eagle River. Because students and adults learn best by doing, emphasis is placed on group participation during field trips.

What They Learn

Soil management, they learn, means maintaining the fertility of the soil, putting every acre to its best use. Groups cut soil profiles to show the top soil, depth of subsoil, and apparent rock. They map soils with a hand level and a soil auger, see proper and poor farm practices, see examples of contour plowing, terracing and strip cropping. They learn that top soil represents a storehouse of plant foods that require probably 12,000 years to accumulate.

Water management, they learn, means maintaining an even flow of clear water for industrial, community and recreational use. Students know that water is essential to life, learn that we use seven times more water than any other resource.

Small stream management is studied at the Northeast Area Headquarters at Woodruff. Here groups put on

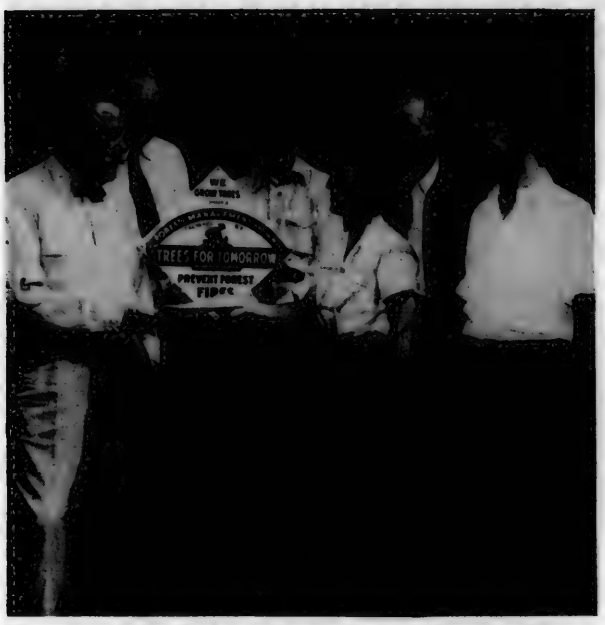

Figure 3. Folke Becker, left, president of Trees for Tomorrow Inc., awarding a boundary marker to Mr. and Mrs. Roderick MacKinnon, Vilas County landowners, for their outstanding work in forest management. The McKinnons have been carrying out recommendations of a forest management plan drawn up for them in 1946.

waders to see how deflectors channel the water so that it digs a cool cover for trout, see floating logs that provide shade for fish and digger logs that turn water to banks where its temperature is lowered. Fishery specialists show campers that fish propagation does not depend solely on dumping quantities of fish into the stream, but that streamside improvement is a basic factor.

At the Rainbow Reservoir, groups learn how to calculate the number of cubic feet of water that passes a certain point. They see that reservoirs not only furnish a continuous supply of clear water, but also prevent floods and protect soils.

Wildlife management, they learn, means maintaining animal populations on a level with their food supply. Groups visit deer yards, see browse conditions, see deer at feeding grounds, visit a beaver dam, and the Wisconsin River flyway, learn that some species become extinct if man upsets the delicate relationship of forests, soils, water and wildlife.

Forest management, they learn, means providing raw material on a sustained yield basis. At a resource stop, campers find how many steps, in their own stride, it takes to make a chain. With the use of a compass, they pace an acre, find it is about the size of a football field. They determine volume of standing timber by using a cruiser's stick. With a forester's help they mark trees for harvesting.

By studying resources first hand, groups see that the purpose of all resource management is to assure an adequate supply of the products of the earth which are essential to man's welfare.

Trees for Tomorrow, in the past 11 years, has distributed 6½ million free trees to 5,488 landowners, machine planted another 3,806,750 trees for 196 people, placed under management 142,122 acres of forest land owned by 410 people, while more than 19,400 people have studied resource management at the Trees for Tomorrow Camp.

These figures are significant, not from the standpoint of the number of trees planted, the number of acres placed under management, or the number of people who have been at camp, but *they do serve as a guidepost in a new pattern that has been laid down for an industrial approach to resource management in Wisconsin.*

Speaking before the State Historical Society at an annual meeting recently, Folke Becker, chairman of the board of Rhinelander Paper Company and president of Trees for Tomorrow since its founding, said: *"We have our goal, a background of green forests for Wisconsin, increased employment, protection of our watersheds and, most important, informed citizens who realize that large-scale, long-range resource building requires coordinated effort and that it cannot be accomplished overnight or by decree."*

Crystallizing this thinking in terms of action is the prime objective to which Trees of Tomorrow is dedicated.

Figure 4. Fish Management. Milking spawn from fish in April at lake near Trees for Tomorrow camp.

Major Plant Types of the Soutwest And Their Relation to Climate and Soils

B. W. ALLRED AND HOMER C. MITCHELL

THE VEGETATION of Arkansas, Louisiana, Oklahoma and Texas is made up of two major plant formations, namely, grassland and forest. Grassland lies largely west of the 45-inch rainfall belt; forest lies east of this belt, where annual rainfall is higher. The differences in sizes of plants are explainable by the fact that trees require the most water, shrubs the next largest amounts and grasses the least. Tall grasses require more water than mid grasses, and mid grasses need more water than short grasses.

Many men have written about the vegetation of these four states since the first white explorers passed through. The main periodicals consulted by the writers are listed at the end of the paper.

To a large extent the boundaries of the four grassland associations and forest formation follow those outlined by Weaver and Clements in their book entitled *Plant Ecology*. System of classifying plant communities is patterned after the one used by F. E. Clements in the book *Dynamics of Vegetation*.

Most of the detail on boundaries of various plant communities was developed by soil conservation district technicians and others in the Soil Conservation Service. The information on vegetation found in various plant communities came from work unit guides on range sites and condition developed for soil conservation districts.

Climate Influences Plant Production

The grassland formation is subdivided into four major associations, namely, True Prairie, Coastal Prairie, Mixed Prairie and Desert Plains Grassland. Each association is the product of its own peculiar climate, with True Prairie having the most favorable rainfall, Coastal Prairie second, Mixed Prairie third, and Desert Plains Grassland the driest. Hence, tall grasses grow in the True Prairie, and the stature and yield of grass become gradually lower from True Prairie to Desert Plains Grassland.

Climatic variations are less radical in the forest formation than in the grasslands, but even here they are evident. For example, forest production is considerably higher than in the 60-inch annual rainfall belt than in the 45- to 50-inch rainfall belt.

Local Factors Influence Plant Patterns

While climate is the major determiner of the kind of vegetation that dominates a broad region, other factors may either improve or decrease the productivity of a site and, hence, modify the kind of vegetation produced. Major changes in elevation, and soil variations due to differences in the parent material, maturity, percentage of minerals and salts, and slope, often have great influence in modifying plant patterns within general climatic belts. Where these variations are great enough to make significant differences in amounts of available soil moisture, there will be changes in the kind of vegetation produced.

Figure 1. Desert Plains Grassland in poor range condition. Big Bend National Park, Texas.

Soil and vegetation are not independent variables, as each has reciprocating influences on the other. For example, soil is made from the mother rocks by the action of water, temperature and vegetation. Vegetation is a key agent in soil making, but the kind that grows is influenced by the maturity of the soil. For example, mosses, lichens and other plant pioneers are the first to inhabit rocks and other raw soil material. Mature soil, however, supports a climax plant community which is highest for the soil and climate.

Local soil conditions in large numbers of areas have profoundly modified the vegetation from what is normal for the climate: Two examples are presented as follows:

1. Communities of bottomland hardwoods along streams that drain grasslands. High water tables or occasional flooding provide added moisture and hence the soils of such river bottoms grow trees instead of grasses.

2. Sandy, gravelly and rock areas that are free of hard pan, claypan or horizontal bed-rock also improve local soil-moisture conditions in the grassland formation. Rainfall intake is high on these soils which also yield up moisture to plants more readily and more completely than do

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Homer Mitchell is woodland conservationist for the Southeastern states, Soil Conservation Service, headquarters at Athens, Georgia.

Figure 2. *Left:* Mixed Prairie—Southern Great Plains in good range condition. The grasses are largely blue grama and buffalograss. *Right:* True Prairie range in excellent condition near Nowata, Oklahoma. Little bluestem, big bluestem and Indiangrass are the most prevalent.

heavier soils. Local plant patterns modified by soil conditions are also found in the Oklahoma and Texas Cross Timbers, Texas Hill country, Lampassas Cut-Plain, Granite basin, East Texas Post Oak belt and eastern Edwards Plateau. In these areas, soil-moisture conditions have been improved sufficiently over the climatic normal that trees or shrubs, particularly oaks, form savannah with the understory composed of grassland dominants of the True Prairie.

Examples where soil conditions cause less favorable plant-soil-moisture relationships also are found and in such instances the plant yield is below that normal for the climate.

1. The Tall Grass Prairie, between the Colorado River in Texas and the Mississippi River in Louisiana, is an illustration of such a situation. This area lies within the forest climatic belt.

Here the Lake Charles and Crowley silt loam soils have poor soil-plant-water relationships, particularly during the critical growing period for forest growth. The subsoils are composed of a dense claypan-like layer, difficult for the tree roots to penetrate. Commercial tree plantings have not been successful and most of this former grassland is now in rice.

Occurrence of prairies in forest and savannahs in the forest belts in Arkansas, Louisiana, Oklahoma and Texas are explainable much in the same way as described in the Tall Grass Prairie. Presence of claypans or claypan-like subsoils creates a subnormal habitat for trees, but such areas are excellent sites for the bluestems, Indiangrass, switchgrass and eastern gama.

2. A similar example of where soils have modified the vegetation in the forest formation is found in those parts of eastern Oklahoma and the Ozark Mountain section of Arkansas where savannahs are intermingled with forest. Deep permeable soils, with good water-holding capacity, produce true forest. But large areas with claypan-like subsoils, shallow rocky soils, or rapidly permeable deep soils have moisture resources that are subnormal for true forest development. Hence, they formerly were covered with tall grasses and the hardwoods were scattered and of low grade. Such savannahs are good grazing land, but are submarginal for forest. Wherever the tall grasses have been taken out by fire and grazing, scrubby hardwoods have filled in. Some landowners are killing the scrub trees on the filled-in savannahs and converting them to highly productive native grasslands.

I. Desert Plains Grassland Association

This association is in reality a savannah of desert shrubs mixed through grassland. Rainfall varies from eight to 22 inches per year, and annual evaporation varies from 60 to 80 inches. The dominant shrubs belong to the lily and Amaryllis families and include several yuccas, sotol, sacahuista and agaves. Chamiso, or four-wind saltbush, is an important shrub that has decreased under grazing. The common grasses are feathery bluestems, Arizona cottontop, bush muhly, plains lovegrass, plains bristlegrass, hairy grama, black grama, curlymesquite and tobosa. Sideoats grama is important from Maverick County, Texas, westward, but is missing from Webb County to Hidalgo County. Tarbush and creosote bush have invaded large areas and are the distinguishing kinds of vegetation in many localities.

A. Rocky Mountain Foothills: This is an area of scattered igneous rock and limestone mountain tops. The Davis Mountain mass is the largest mountainous area and 9,000-foot Guadalupe Peak is the highest. The highest peaks grow western yellow pine, pinyon pine, weeping

juniper, alligator juniper, one seed juniper, redberry juniper, Arizona cypress, Emory oak and gray oak. The important grasses are cane bluestem, little bluestem, Texas bluestem, sideoats grama, green sprangletop, Arizona cottontop, bush muhly, New Mexico feathergrass, balsamscale, several large muhlys, tanglehead, black grama, hairy grama and blue grama.

II. Mixed Prairie Association

This great semiarid grassland is dominated by a mixture of mid and short grasses. Of the mid grasses, sideoats grama, silver bluestem, sand dropseed and purple threeawn are found throughout the Mixed Prairie, western wheatgrass and needle-and-thread grow in the northern half, and Texas wintergrass is an important cool-season grass in the southeastern part. Buffalo-grass, blue grama and hairy grama are common short grasses. Curly-mesquite is an important short grass in the southern part.

A. High Plains Bluestem: Widely scattered over the Mixed Prairie are deep sandy areas and canyon breaks which provide a better-than-average habitat for grass. Here grow the taller grasses, found in the True Prairie immediately to the east. The important ones are little bluestem, sand bluestem, Indiangrass, switchgrass, sand lovegrass and sideoats grama. Havard's shinnery oak and sand sagebrush occurred sparingly in part of this type. At present, oak and sagebrush have become dominant and grass is scarce.

B. Shinnery Oak Savannah: Fractured limestone beds in parts of the Edwards Plateau provide better-than-usual sites for the dominant grasses of the Mixed Prairie, plus some species of low growing oak known locally as shinnery. Little bluestem, pinhole bluestem and green sprangletop also add variation to this part of the Mixed Prairie.

C. Post Oak Savannah: The bulk of this type lies within the True Prairie grassland association and will be described there.

D. Rocky Mountain Foothills: A small area of this type is found on Black Mesa in northwestern Oklahoma. Black Mesa is the eastern extension of Mesa de Mayo, an igneous-rock highland originating near Raton, New Mexico. The vegetation is generally similar to the Rocky Mountain Foothills in southwest Texas, already described. Two important cool-season grasses, western wheatgrass and Nevada bluegrass, are added. Galleta is a warm-season grass which is found here, but not in the Desert Plains grassland in Texas.

III. True Prairie Association

The True Prairie association lies between the 25- and 45-inch annual rainfall belts in Oklahoma and Texas. The key grasses are little bluestem, big bluestem, Indiangrass, switchgrass and sideoats grama. The latter is more prevalent in the western half.

Figure 3. Coastal Prairie range in excellent condition near Crystal City, Texas. Tanglehead and cane bluestem are the dominant grasses.

A number of savannahs are superimposed upon this broad area, but the grasses that identify the True Prairie are important in the savannahs, too. The prairies growing on the blacklands of Refugio, Calhoun, Victoria, Jackson, Matagorda and Wharton Counties, Texas, more nearly resemble True Prairie than Coastal Prairie.

A. Post Oak Savannah: Post oak savannah includes the Oklahoma and Texas Cross Timbers and east Texas Post Oak belt. The dominant grasses of the True Prairie are the important ones. Purpletop, an additional grass, is found throughout, while beaked panicum is an identifying species in the easternmost savannahs. Post oak and blackjack oak are the important trees which identify this distinct and obvious plant community.

B. Hill Country Savannah: This type lies mostly within the Texas Hill Country, and Lampassas cut-plain. Trees of this savannah are largely live oak, Spanish oak, with numerous inclusions of several species of shinnery oak. True Prairie grasses dominate, and hairy grama becomes a minor constituent.

C. Live Oak—Post Oak Savannah: This type is found in the granite basin located mostly in Mason and Llano Counties, Texas. Tree cover is mostly post oak, blackjack oak and live oak. The grasses are typical True Prairie dominants, plus purpletop and sand lovegrass.

D. Bottomland Hardwoods: Bottomland Hardwoods are similar to those described under Coastal Prairie (IV).

E. Pine-Hardwoods: Two islands of shortleaf pine mixed with hardwoods are located in Bastrop and Fayette Counties, Texas. This is a marginal forest site, being about a 60-foot pine site.

IV. Coastal Prairie Association

This plant association is located in southern Texas and northeastern Mexico, where rainfall is 18 to 26 inches annually. Originally it was grassland composed of north-

ern and subtropical dominants. It is now known as the brush country, because of the dense stand of subtropical shrubs that have invaded from Mexico.

The important grasses are feathery bluestems, seacoast bluestem, tanglehead, Arizona cottontop, plains lovegrass, plains bristlegrass (both tall and short forms), trichloris, lovegrass tridens, purple threeawn, hairy grama, slender grama, buffalograss and curlymesquite. Sideoats grama and Texas wintergrass are important along the northern and eastern boundaries. Indiangrass, gulfdune paspalum and switchgrass are important plants in sandy soils.

The leguminous shrub guajillo, plus chamiso, yuccas and agaves, form savannah with grassland over a large part of this association.

A. Post Oak Savannah: The southern extension of the post oak savannah found in the True Prairie cuts into the northeastern Coastal Prairie, where it changes somewhat in its characteristics. Considerable live oak mixes with post oak and blackjack, and many of the grassy dominants of the Coastal Prairie are replaced by those typical of the True Prairie.

B. Bottomland Hardwoods: Hardwood trees are crowded densely over the well watered bottomlands. Species of oak, ash, elm, hickory, willow and sycamore are some of the most important. Dense tree growth with an understory of shrubs prevents grass from growing well, so little or no grazing is available. Wildrye and rescuegrass produce some growth in winter after tree leaves have fallen.

C. Gulf Coast Marshlands: The marshlands are restricted to narrow belts along the Gulf of Mexico and a few inland bays. The important grass species of the salt marsh are big cordgrass, marshhay cordgrass, gulf cordgrass, smooth cordgrass, common reed, seashore saltgrass, switchgrass, Olney bulrush, longtom, seashore dropseed and knotroot bristlegrass. Sacaton apparently was once important in the higher salt marsh adjacent to the Coastal Prairie, but not east of there. Bushy sea oxeye, a dwarf shrub, also is important, and increases under grazing. In freshwater marsh, southern wildrice and paille finne are two of the most important grasses, but are not found south and west of Beaumont, Texas.

V. Eastern Forest Belt

The eastern forest formation lies generally east of the 45-inch rainfall belt. Because of higher rainfall, commercial forests occur except in savannahs and prairies where poorer soil-plant-moisture conditions prevail. The important plant communities lying within the forest formation are as follows:

A. Mixed Hardwood Forest and Savannah: This community includes intermingled upland hardwood forest, hardwood savannah and cedar glades. Frequently these types occur in areas too small to map separately. Of the total area now in woody growth, about 55 per cent is in upland hardwood forest, 40 per cent in hardwood savannah and 5 per cent in cedar glades.

The upland hardwood forest sites are those with soils having adequate moisture-storage capacity to produce hardwood trees of sawlog size and quality in normal stands. The identifying species, when present, are white oak, northern red oak, southern red oak. There is a high percentage of other red oaks, black oak, various hickories and gums which are not limited to the forest type.

The savannah sites are those which have a woody aspect, but where the soil lacks the moisture-holding capacity to produce trees of sawlog size and quality in normal stands. Many stands have good density because of long continued burning and overgrazing, but the stems are small and highly defective. Generally, however, the trees are widely spaced, short bodied, full crowned, with an understory of native grasses and other herbaceous vegetation. The identifying species are blackjack oak, post oak, winged elm, cedar elm, black oak, hackberry and hickory. The first three usually predominate. Only occasional trees, principally post oak, produce sawlog sizes of commercial quality, and these usually have less than one log of usable length. Such trees are so scattered as to discourage logging.

The cedar glades occur on areas where the soil moisture capacity is extremely low and cedar has thickened on the overused grasslands.

B. Prairies in Forests and Savannahs: Livestock of pioneers in the forest formation found excellent grazing on these original scattered prairies. These prairie soils are too drouthy for forest, but big and little bluestem, switchgrass, Indiangrass and eastern gama, plus numerous nutritious forbs, grow abundantly. Most of the former prairies have been plowed and are now farmed. A few still are found in various degrees of perfection. Few, however, are in excellent condition.

C. Pine-Hardwoods: The pine-hardwood community is the common one of the Coastal Plains and the Ouachita Mountains. Soil moisture is adequate for commercial forestry, producing trees of sawlog size and quality in a reasonable time. Shortleaf and loblolly pines are the principal commercial species, because of both their rate of growth and value. Commercial hardwoods commonly associated with the pines are gum, white oak and southern red oak. Other common associates are blackjack oak, post oak, hickories and bluejack oak, which sometimes are dominant where the commercial species have been eliminated or seriously reduced by unwise cutting.

D. Bottomland Hardwoods: The remaining bottomland hardwoods are on those portions of the flood plains too low in elevation or two small in area for economical protection against flooding by levees, or poorly drained for cultivation or use for tame pasture.

Composition of the several bottomland hardwood types

Figure 4. Pine-hardwood forest typical of kind found in Arkansas, Louisiana, Oklahoma and Texas. Low grade hardwood species have been girdled in order to kill them so better timber trees can thrive.

varies with the degree of wetness, which also reflects soil texture. The lighter soils occur on the ridges or better drained areas and produce the most valuable timber. The trees consist largely of sweet gum, red oaks, swamp white oak and white oak, elms, pecan and water oaks, together with a representation of many species of lesser importance.

The low-lying clay flats are less productive of commercial timber. The species are largely honey locust, bitter pecan, overcup oak, water oak, and hackberry, which is usually defective, along with some cedar elm, green ash, American elm, persimmon and willow.

E. Tall Grass Prairie: This area has been converted largely to rice production. The heavy, nearly impervious soils that are too drouthy to produce forests once supported a vigorous stand of tall grass, including big and little bluestem, pinehill bluestem, switchgrass, Indiangrass, eastern grama and a host of associated forbs. The heavy subsoil that thwarted tree roots provides a solid bottom to hold the water used in rice irrigation.

F. Shortleaf Pine Type: Shortleaf pine occurs in pure stands in the Ouachita, Boston and Ozark Mountain areas on vertically bedded shale and sandstone soils having good moisture-holding capacity. Shortleaf pine is almost the only tree of commercial importance on such soils. Associated hardwoods are mainly southern red oak, black oak, blackjack oak, post oak and hickory.

G. Upland Hardwood Type: The Upland Hardwood type, except as intermingled with prairies and savannahs in the mountain areas, occurs on the narrow, loessial ridges paralleling the Mississippi River. The principal trees of commercial value are white oak, various red oaks, tulip poplar, white ash, persimmon and walnut. Associated are the usual low-value scrub oaks, beech and hickories. Occasional specimens of sassafras, cottonwood, American elm, red elm and others reach large sizes and are of excellent quality.

H. Longleaf Pine Type: Longleaf pine type is a singular community that deserves special recognition. The principal longleaf pine areas are recognizable today by one or more of the following: (1) Presence of longleaf pine forest; (2) Presence of occasional specimens of longleaf pine in generally undeveloped cutover land; (3) Extensive treeless areas (except stream borders and "bay galls") or areas occupied by the scrub oaks and hickories; (4) Specimen longleaf pine in young stands of loblolly, shortleaf or slash pine.

The land is, with very minor exceptions, characterized by shallow, poorly drained soils or deep coarse sands. In either case, they are "drouthy" and poorly adapted to cropland agriculture. These soils are primarily suited for forest production.

I. Cypress-Tupelo Swamp: Cypress-Tupelo swamp is found in parts of the lower Mississippi River Delta, which lies under water of fluctuating levels except during rare periods of prolonged drouth. Cypress and tupelo gum appear to be the only tree species able to tolerate such prolonged flooding. Hence, they occur in pure stands of either species or mixtures of the two. Included in such areas are hummocks and narrow ridges, subject to only annual flooding, which may be occupied by the water oaks, pecan, willow and other hardwood species characteristic of the wetter portions of normal bottomland.

J. Gulf Coast Marshlands: See discussion of Gulf Coast Marshlands under Coastal Prairie (IV).

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A Method for Determining Surface Runoff from Watersheds

DONALD E. WHELAN AND NORMAN R. TRIPP

Determination of the amount of surface water runoff that may be expected from a given watershed under varying storm conditions is a matter of considerable importance. It is the surface runoff which, because of its speed of concentration and flow, makes the most immediate and most devastating contribution to flood peaks. It is the rapid loss of this surface runoff which might otherwise infiltrate the soil and recharge depleted ground-water supplies that contributes materially to critical low flows. It is also within the limits of manipulating the amount of surface runoff by changing land cover and use that the watershed manager must operate to secure his objectives.

THE AMOUNT OF SURFACE runoff which results from a storm of given intensity over a particular watershed area can be determined by two different methods. The first of these is by simulating rainfall by artificial application of water and measuring the amount infiltrated into the soil and the amount which runs off over the surface. This method is widely used, but is both time consuming and expensive. The second method and the one described below is by a mathematical computation in which the storm rainfall is timed as it passes through the soil. Before discussing this procedure in detail it is necessary to review very briefly the relationships which affect the movement of water through the soils.

Soil-Water Relationships

The capacity of a soil to absorb and transmit water depends primarily on its development and structure. The elements of texture, depth, internal drainage and the extent to which the soil has been disturbed or modified by land use and management are all important. A soil which has developed or matured in place usually consists of three distinct layers of soil. The surface layer is composed of mineral matter mixed with organic matter deposited by surface vegetation and is known as the "A" horizon. The "B" horizon, or second layer, consists of weathered mineral material enriched by leaching of salts and organic matter from the upper layer. The lowest layer, or "C" horizon, consists of unconsolidated parent geological material. Each of these three horizons may and often does have a different and distinctive structure and may have widely differing abilities to absorb and transmit water.

Soil structure is the term used to denote the arrangement of soil particles and aggregates into certain patterns. The voids or spaces between these particles which make up the soil mass represent the volume available for water storage and its amount, size and continuity depend on the arrangement and size of the soil particles and aggregates. Thus the soil structure determines how much water can be retained in either permanent (retention) or temporary (detention) storage and the rate of its downward movement through the soil. The so-called permanent or retention storage is that part of the water which is held strongly enough by surface attraction to the soil particles to resist the pull of gravity. Some of this retention storage water may be lost to the stronger pull of evaporation or by transpiration through the surface plants.

Water Movements in the Soils

When water enters the soil the first of it goes to satisfy any deficiency in the retention storage which may have occurred through transpiration or evaporation. Once the retention storage is satisfied the remaining water goes to fill the available pore space until the point of saturation is reached. The amount of water between that necessary to satisfy retention storage and the point of complete saturation is known as detention storage. The water in detention storage is free to move downward and laterally in the soil and constitutes the supply available for recharge of the ground water or for lateral flow to feed springs and streams.

After penetrating the soil surface, the water percolates quickly down through the "A" horizon filling the pore spaces as it goes until it reaches the level of the "B" horizon. If the structure of the "B" horizon is such that its percolation rate is equal to or greater than that of the "A" horizon the water continues downward at the same rate. However, if the percolation rate of the "B" horizon is less than that of the "A" horizon, which is the usual case, or if an impeding layer, such as claypan or hardpan, is present the downward progress of the water is abruptly slowed. If the rainfall continues at a rate greater than the lowest percolation rate of any impeding layer, the soil above the impeding layer gradually becomes saturated until spill-over and surface runoff occur. At the same time a lateral subsurface flow begins along the impeding layer until it reaches a point where the downward progress

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Figure 1. The influence of a wide variety of factors such as land use, soil types, drainage patterns, and topography must be estimated and correlated to determine the effect of land management on both surface runoff and flood peaks.

is easier or until it breaks out to the surface and runs off as surface flow.

Rainfall rarely continues at high intensities over long periods of time, but rather in bursts of heavy falls interrupted by lulls. Since the downward and lateral movement of water in the soil continues even during these lulls, temporary storage again becomes available in the upper layers and more water can infiltrate into the soil. Thus, the soil behaves much as would a pail with holes in the sides and the bottom and being filled from the top. If water is poured into the pail faster than it can drain away through the holes, the pail soon fills and spill-over occurs. However, if the supply of water is decreased or stopped, drainage continues through the holes and more storage capacity is made available.

Another factor which must be considered in calculating surface runoff is that of roughness of the soil surface. Each depression in the ground or piece of litter on the surface acts as a temporary check dam to prevent surface flow. In addition to acting as actual storage space, this delay in runoff gives the water more time and a better opportunity to infiltrate into the soil. The degree of surface roughness is greatly influenced by such land management practices as contour plowing, strip cropping, mulching, and those designed to develop a good vegetative cover.

The kind and amount of vegetative cover also play an important part in protecting the soil surface against the impact of raindrops. When the surface is not adequately protected the impact of the raindrops produces puddling and sealing of the surface pores. This may so change the rate of infiltration through the surface soil that surface runoff occurs even though the soil below may still have ample storage capacity.

Routing Procedure. To calculate by the timing or routing procedure the amount of surface runoff that will occur from a particular storm in a watershed, it is first necessary to take samples from each soil horizon under all of the varying conditions of cover and use to be investigated. These samples are studied in the laboratory to determine the soil structure, the available pore space, and the percolation rate. A calculation is then made of the time for passage through the pore space of the successive soil horizons of the actual amount of water known to have fallen during the storm, including all its timed variations in intensity. By keeping account at all times of the amount of detention storage already used, it is possible to determine at any point in time which soil horizon is controlling the intake of water to the soil, the rate of intake, and the amount, if any, of surface runoff. With this method it is also possible to determine the effect of infiltration recovery during lulls in the storm when the

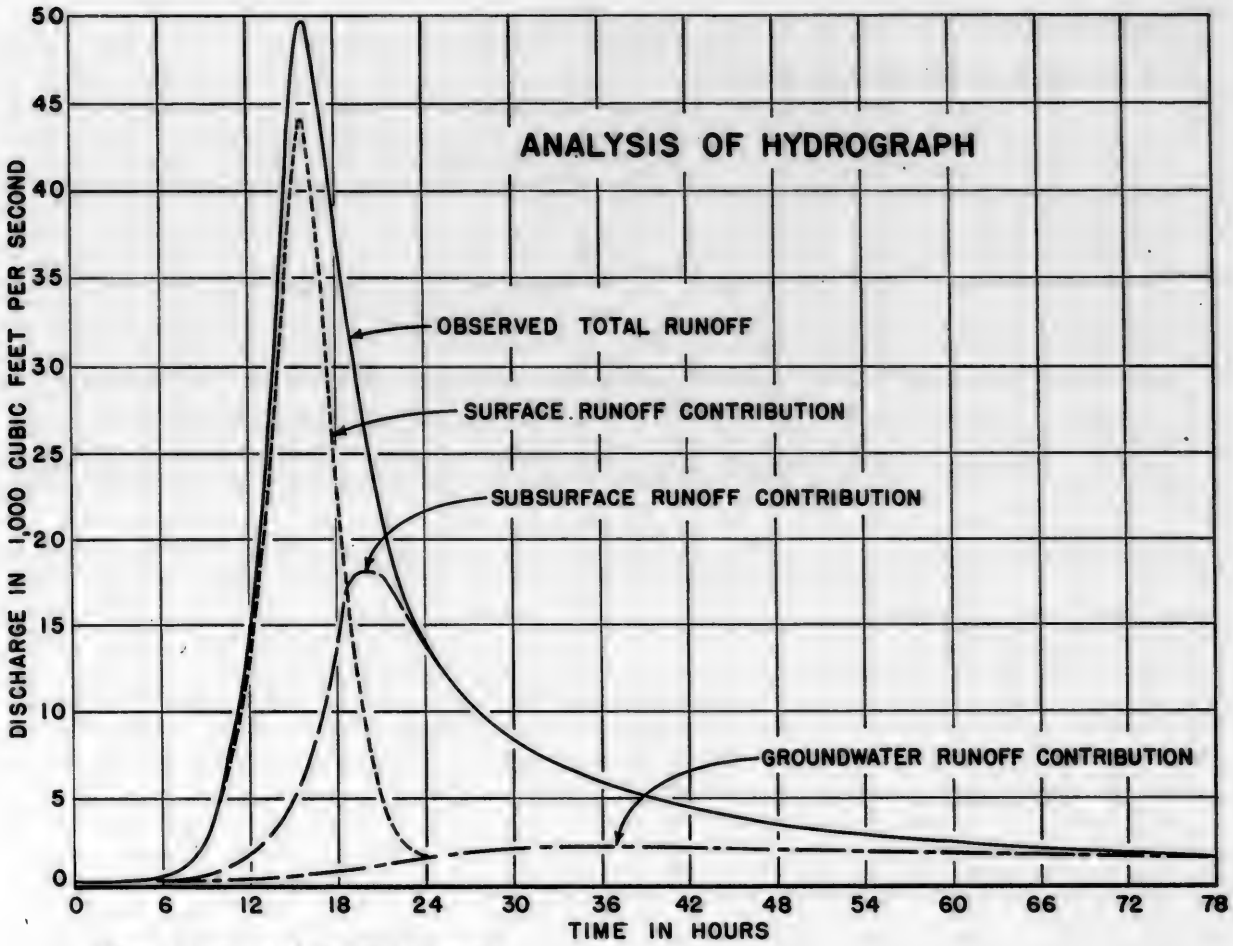

Figure 2. Analysis of the flood hydrograph.

water in surface storage and in the upper soil horizons has an opportunity to drain into the lower levels and also laterally.

Rainfall Analysis. To learn how surface runoff contributes to flood peaks in a watershed it is first necessary to analyze rainfall and runoff for historical storms on which data have been collected. From weather records and other similar information, an estimate is made of the amount of water and the remaining available storage space in the soil at the beginning of the storm. From these same records the varying amounts of rainfall over the watershed are determined from the storm center to its outer limits. An inventory is made of all the combinations of soil types and vegetative cover and use. Using the values determined from laboratory analysis of the soils, the amount of rainfall known to have occurred at a particular point is timed through the soil profile for each soil-cover complex at that point and the amount of surface runoff is obtained. The total surface runoff for the watershed is found by multiplying the surface runoff for each soil-cover complex by the known area of the complex.

Runoff Analysis. The total flood runoff from the watershed is measured by a continuously recording device at a stream gaging station in terms of stage or height of water in the stream. From previous studies the rate of flow is known for each of the varying stream stages. By converting the continuous record of flood stage into terms of rate of flow, a graph called a hydrograph can be prepared which shows the continuous relation between time and rate of flow. This hydrograph shows when runoff started, how it built up to a peak of flow and stage, and then gradually receded again to normal flow. It is possible by mathematical means to separate this total flood hydrograph into its component parts and then prepare individual hydrographs for the surface, subsurface and ground-water flows and show how and when each contributed its share to the total peak. As a check, the volume of surface runoff shown by the surface flow hydro-

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Economic Evaluation of the Efforts of Conservation Farming

RUSSELL O. OLSON

This article is primarily concerned with the economic evaluation of conservation farming from the standpoint of the individual farmer. The level of conservation and the means of achieving it are different for different farmers because of the different values they place on income to be received in the future. In deciding on a land use program, a farmer must select from a number of alternatives which offer different distribution patterns of costs and benefits over time. By discounting these future costs and incomes to their present value he has a valid basis for comparing alternatives and selecting the best. The length of time a farmer takes into account in his plans, the need for money now relative to anticipated future needs, the availability of savings or credit, and his disposition with regard to assuming risks all affect the rate at which he discounts future costs and returns and thus determines the level and means of conservation that is best for him. Thus, conservation plans must be tailor-made to the individual farmer's circumstances if they are going to be economical for him.

THE CRUCIAL QUESTIONS that farmers face in deciding on a conservation program are: (1) What is the best level or degree of conservation? and (2) What is the best way to achieve it?

Unfortunately, there is not complete agreement as to what is meant by conservation farming. But a few general definitions will indicate the sense in which I use terms that mean different things to different people. First, may we think of conservation as referring to the distribution of use of a resource over a period of time, with the time period broken up into a series of time intervals. Thus, the conservation problem may deal with how the annual use rates of soil resources should be distributed in, for example, the next 50 years. A rearrangement of the use pattern so that future rates of use are increased represents conservation. A rearrangement resulting in a decrease in future rates of use would represent depletion. In measuring the degree of conservation (or depletion) it would be necessary to assign weights to the use rates for each future time interval. But, here, the term "conservation" is interpreted broadly enough to include any practice that results in a rearrangement of the time distribution pattern of use rates in favor of the future.

The "Best" Level of Conservation

Following this definition, the question of the optimum level of conservation might better be stated in terms of the optimum pattern of resource use over time. What is this optimum pattern? The answer depends largely upon who is asking the question. Whether the question can be answered reasonably well for society as a whole is doubtful. Is there any way in which we can determine the pattern of soil resource use that would be most satisfactory to society in the next 100, 500 or 1,000 years? This problem involves generations and the optimum for this generation is likely to differ from the pattern considered best by some other generation. Therefore, it may make little sense for us to try to measure the economic effects of conservation for society as a whole over long periods of time. But, for shorter periods of time, we generally assume that under our system of free enterprise, market prices reflect the pattern of resource use desired by society. Free market prices are expected to dictate the range and combination of farm and non-farm goods that would give consumers the greatest satisfaction during the period they consider relevant. If the market operated perfectly, the optimum pattern of soil resource use for society would be achieved by getting each farmer to adopt the most profitable pattern of use for his farm. That the market does not work perfectly to reflect the resource use desired by society is generally recognized; nevertheless, decisions regarding levels and means of conservation are made by individual farmers guided largely by prices and profits. To be very effective, an appeal to them to change their land use needs to be made on the basis that it will pay.

What then is the optimum pattern of soil resource use, or level of conservation, for an individual farmer and how can it be achieved at least cost? The answers depend upon a number of things. The physical effects of a particular practice under certain conditions may be the same for all farmers, but the values placed on the physical effects would not be the same. There are several reasons for this. (1) Not all farmers consider the same time

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The oceans are the source of all moisture.

Photo U. S. Department of Agriculture

The Nation's Available Water Resources . . .

When we think of the term water resources a number of things may come to mind. Some may think no farther than the water faucet in the home, others may think of springs, wells, creeks, rivers or lakes. Still others will ponder over the hydrologic cycle; that is, the movement of water from the atmosphere to the land, to the seas, and back to the atmosphere again. The phases of this cycle are: Precipitation, which falls primarily as snow, rain, hail; the infiltration of water into the soil; surface and subsurface runoff; and the evaporation and transpiration of moisture to provide atmospheric water vapor which will again be released as precipitation. Our water resources are tied to this hydrologic cycle and the sun is the source of energy that activates the cycle.

Total Available Water

Over a long period of time the source of all moisture is the ocean. It has been estimated that the total average annual evaporation from the oceans amounts to 275 billion acre feet. (*One acre-foot is the amount of water that will cover one acre of land one foot deep. It equals approximately 325,900 gallons*). The amount of precipitation that falls on the oceans is about 244 billion acre feet and the amount supplied to the oceans from runoff from the lands is about 31 billion acre feet. Thus the amount of water released and returned to the oceans is in balance. The total precipitation on land is estimated to be 82 billion acre feet. The evaporation from the land and inland water surfaces is 51 billion acre feet. This, in addition to the 31 billion acre feet of water returned to the oceans as runoff balances the precipitation on the land.

Precipitation. Precipitation is measured at approximately 11,000 stations over the United States. Some of these stations have been in operation for many years, others for shorter periods. These records furnish the basis for determining the amount of precipitation that falls over the nation. Our gross water resources, on an average annual basis, amounts to approximately 4.8 billion acre feet. When this is spread over the total area of the United States (*30 inches*) it gives some idea of the amount of water involved. It is not at all uncommon for there to be a marked variance in rainfall with the seasons, with the wetter season frequently yielding twice as much rainfall per month as the dry season. In general, streamflow rises and falls in response to these seasonal variations, and of course, it responds quickly to heavy precipitation, and fails to appear in long periods of low precipitation, when most of the rainfall is returned to the atmosphere by transpiration and evaporation. Not all

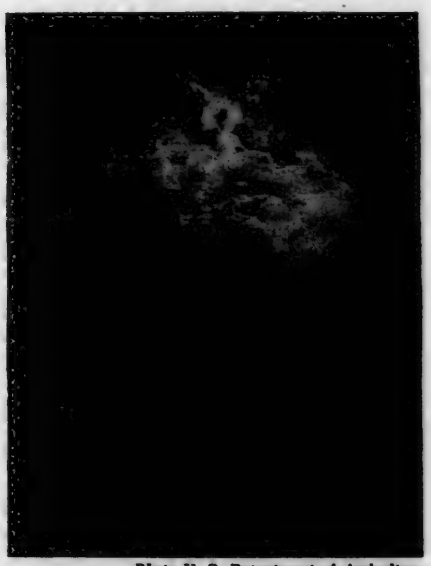

Photo U. S. Department of Agriculture

Rainfall replenishes our water supplies.

Photo U. S. Department of Agriculture

Large amounts of snow is stored in natural reservoirs in mountainous regions.

of this precipitation comes in the form of rain. In large areas of the United States snowfall during the winter and early spring months provides a large percentage of the water used for irrigation, power development, municipal and other uses. In many of the higher lands in the west, or along valleys draining the high lands, the runoff may be as much as 20 inches per year as a result of these snow melt conditions. All of this precipitation, however, does not fall evenly over the United States. The water resources of different areas of the nation vary greatly. This is readily illustrated by comparing the precipitation and vegetation in the desert country with that of the eastern United States. Thus, there are areas of excess and deficit water resources. The State of Louisiana[1] gets almost twice as much rainfall (*55 inches*) as the average for the United States, while the State of Nevada only gets about one fourth or 8.8 inches. Snowfall varies in the same manner. The seasonal snowfall at Tamarack, California during the winter of 1906-07 amounted to 73 feet. A brief review of the developments over the nation will show that the progress of many areas is greatly influenced by the available water resources.

Storage Resources

Not all of our water resources are in such a location or under controlled conditions that are favorable for economical utilization. There is little question that the gross water resources of the nation greatly exceed our present use. There is also no question that water resources are deficient in terms of the right amount at the right time in the right places in large areas of the country.

Runoff. The component of the water cycle that has great potential for development is runoff. Heavy use, in some areas, is being made of the runoff that flows from the headwaters to the seas; in some arid areas the total flow of some of the streams is being utilized. However, of the total runoff available in the entire United States only a small percentage is put to use by man. When we consider runoff, we are dealing with about 29 per cent of the average annual water resource. The other 71 per cent is accounted for by evaporation and transpiration.

Surface Storage. Controlling and making economical and efficient use of our water resources has long presented a challenge to constructive thinking people. The establishment of a national policy for the development of our water resources has largely been dictated by the needs and demands of our expanding economy. We now recognize that the water resources of an entire river system should be developed for many purposes. The fact that a large percentage of our total water flows down the streams to the oceans focuses attention on these streams as a source of water that can be developed for beneficial uses. To make maximum use of this water it has to be controlled and diverted to locations where it can be used.

Some water is pumped directly from the streams and lakes. Storage facilities are provided for purposes such as flood control, municipal water supply, hydroelectric power, and irrigation. The amount of storage provided depends on a number of conditions: Available water resources, economic feasibility, site conditions, water requirements, and volume of runoff to be controlled. All of these would not be applicable necessarily to all project purposes. The development of our river systems to their

Water which flows from the land enters streams and begins the journey to the seas.

Photo U. S. Department of Agriculture

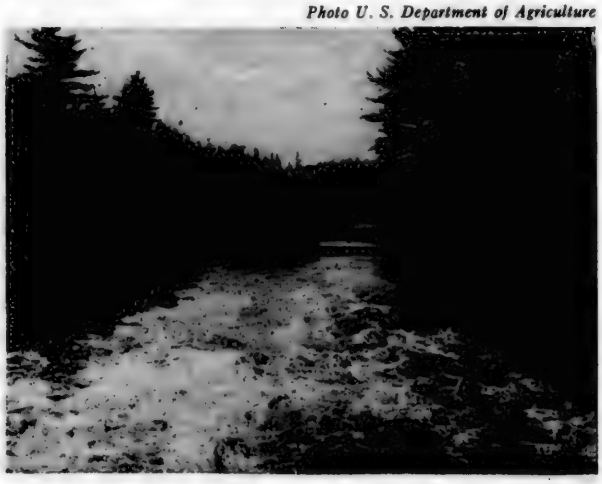

Photo U. S. Department of Agriculture

Left: Large reservoirs are used to store and control stream runoff. *Right:* Water from ground water reservoirs is extracted by pumps.

present status has been a gradual process requiring great expenditure of funds, and the benefits accruing to these projects also have been great. The development of storage facilities for irrigation purposes has progressed rapidly, primarily in the 17 Western States. Usable storage capacity in reservoirs with more than 5,000 acre feet in 1954[3] amounted to more than 278 million acre feet. Of this amount 60 million acre feet were for irrigation. The remainder was for municipal water supply, flood control, power, navigation, recreation and other uses. There are a total of 1,300 reservoirs in this classification.

Ground Water Storage. Part of the hydrologic cycle is the storage and release of water in nature's great ground water reservoirs. These underground reservoirs are continually being replenished by the precipitation that falls on the land. Storage is being depleted by the lateral movement of the water which emerges as springs and as seepage which augments and sustains the base flow of streams. Where glacial materials have been deposited to a thickness of several hundred feet, it is not uncommon for half of the streamflow to appear as groundwater discharge continuing long after wet seasons. The economical development of groundwater depends upon the occurrence of thick layers of porous materials or large crevices in the bedrock. These conditions are usually found only in local areas. For example, high-capacity groundwater developments are available in the sandy deposits beneath the High Plains of Texas, and in the permeable bedrock materials beneath much of the area of the North-central States. Under favorable conditions the rate of storage and the rate of release of the stored water can be speeded up by artificial means. This can be accomplished by releasing surplus surface water over porous soils with a high infiltration rate. The release of stored water can be effected by developing wells and pumping. Not all of our ground water reservoirs behave in the same manner under heavy use. In some of our arid regions the rate of pumpage far exceeds the rate of replenishment. Under these conditions the water table level is receding at a rapid rate. There are other regions where the replenishment rate is in balance with the use rate and considerably greater development could take place without lowering the water table level. Temporary lowering of the water table might not necessarily indicate over-development of the water resources. If ground water depletion is a result of a series of dry years, the ground water reservoir will be restored to normal levels during wet years.

The information available on our total ground water resources for the nation as a whole is not conclusive. Detailed investigations have been limited to specific regions. Ground water reservoirs now yield about one-sixth of the nation's withdrawals from the ground, streams and lakes.[1] It is estimated that the ground water reservoirs have a storage capacity several times that of the Great Lakes or approximately equal to 10 years average rainfall. It is not, however, economically or physically feasible to develop a great percentage of this storage for beneficial uses.

Supplemental Sources

The critically short supply of water in some regions and estimates that the demand for water will continue to increase have given emphasis to the need for research and investigations to determine if there are feasible means of supplementing our normal water resources. In the past few years, research has been initiated with hopes of accomplishing this objective. Two approaches that have received considerable attention are weather modification and control and the refinement of sea water to produce fresh water.

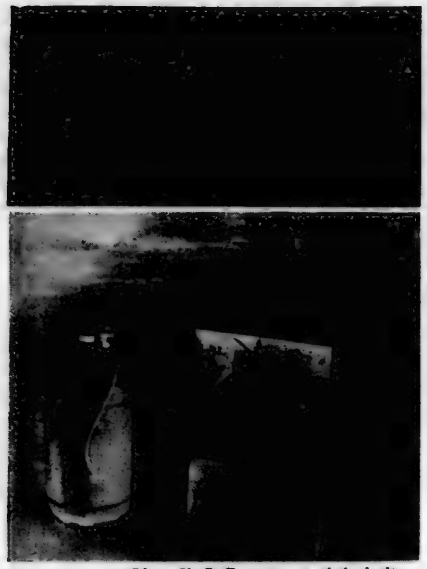

Photo U. S. Department of Agriculture

A silver iodide generator used in seeding clouds.

Weather Modification and Control. Operations for seeding clouds have been carried out on a commercial basis in some of the western regions with the objective of inducing precipitation or increasing precipitation by artificial means. Attempts of one kind or another have been made for this purpose over a long period of years. Only during the past few years, however, have scientific studies been made to try to determine how much or how little precipitation may be produced by seeding clouds. A variety of substances and methods are used in cloud seeding. These include the use of dry ice, salt particles and silver iodide crystals which are released from airplanes or ground generators. A statement released by the American Meteorological Society on weather modification and control indicates that cloud seeding acts only to trigger the release of precipitation from existing clouds. The meteorological conditions most favorable for artificial release of precipitation are very much the same as those which usually lead to the natural release of precipitation and this makes the evaluation of the effects of seeding difficult and often inconclusive. This statement also indicates that present knowledge of atmospheric processes offers no basis for the belief that the weather or climate of a large portion of the nation can be modified by cloud seeding. The results of experiments which have been conducted to explore such large scale effects are considered to be inconclusive. Conclusions of research and studies indicate that further experimentation is desirable and necessary to settle some of the issues concerning the effects of cloud seeding.

Processing Sea Water. Obtaining fresh water from sea water is not a new process. It has been accomplished for hundreds of years. Technically it is entirely feasible. The problem is primarily one of producing fresh water from sea water cheaply enough to compete with the development and use of natural fresh water resources. There are special uses which justify the high cost of producing limited quantities of fresh water from sea water, such as to supply troops in areas without suitable natural water supply. Two approaches to this problem are to remove the water from the salts or to remove the salts from the water. Distillation systems of one kind or another are used to remove the water from the salts in the sea water. There are additional methods for doing this, such as osmotic methods. The methods used for removing salts from the water are generally of a chemical nature, such as the ion exchange system. In the hydrologic cycle, the sun supplies the energy for the evaporation of moisture from the oceans which falls as precipitation on the land. Economical means of using this same free source of energy to obtain large quantities of fresh water directly from sea water have not been found. Development of fresh water directly from salt water for agriculture and industry probably will not take place until the cost of processing is in a competitive status with that of the development of natural fresh water resources.

Water Conservation and Reclamation

The increasing demands on our water resources will make it imperative that steps be taken to conserve and efficiently use our present water resources. It is estimated that about 71 per cent of the total annual precipitation is returned to the atmosphere through evaporation and transpiration. This suggests that another opportunity to make beneficial use of water under certain conditions might be by decreasing losses due to these causes. The efficient control of water used for irrigation and other purposes might release additional amounts for development purposes.

Re-use of Water. The water that flows in the streams is subject to being used over and over many times. A series of hydroelectric plants on a stream is an example of the same water being used to generate electricity at a number of locations. Some industries re-use water withdrawn from streams several times before returning it to the stream. The pollution of streams with industrial and other wastes reduces the usefulness of stream flow for certain purposes and imposes added cost in purification processes. Here again greater use can be made of the water resources through the careful planning and control of withdrawals from and discharges into streams. Water purification systems can aid greatly in keeping our water fit for use.

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This section was prepared by W. G. Shannon, *Soil Conservation Service*, with the assistance of Carl B. Brown, *Soil Conservation Service*, H. E. Hudson, Jr., *Illinois State Water Survey Division*, and W. B. Langbein, *U. S. Geological Survey*.

Economic Evaluation

(*Continued from page* 132)

period relevant. Some farmers may plan for a period of 20 or more years, whereas some plan for only a single year. (2) Of those farmers who plan for the same time period, not all will place the same value on a given return five or 10 years hence relative to current income; that is, they discount the future at different rates. (3) Estimates of future costs and returns are always uncertain. Not all farmers are in equal position to take risks and some are more cautious than others; consequently, the values placed on uncertain events in the future are likely to differ for different farmers. (4) Finally, the values of some benefits are not easily determined because markets do not always exist for these products. For example, the proper price to put on forage depends largely upon how it can be utilized especially in areas in which no cash market exists. Thus, the value of a ton of hay on a cash-grain farm may be only a fraction of the value of a comparable ton of hay on a dairy farm.

The Planning Period

Why do different farmers consider different time periods in planning the use of resources? Security of tenure is perhaps the chief factor. A farmer who operates a farm under a one-year lease, and who is fairly certain that he will not operate it the next year, is obviously concerned with obtaining the maximum returns in the current year. He does not take into account the effect on the use obtainable from the resources in the future. An owner-operator who is nearing retirement or who plans to sell his farm soon may be interested in getting all he can out of the farm now. Many landlords, too, are concerned with relatively short time periods.

Discounting the Future

The statement that different farmers discount future incomes at different rates deserves elaboration. In making plans for future expenditures and returns, alternative plans are usually compared. Direct comparisons of costs or incomes in different time intervals are difficult; it is usually convenient to convert them to their present values. This is done by discounting.[1] If the interest rate used in discounting is five per cent, the present value of $100 of income to be received 10 years hence is only $61; if the interest rate by which $100 of income is discounted is 10 per cent, the present value is only about $39. Thus, in deciding upon the use pattern of a resource over time the rate of interest becomes important. A rise in the rate of interest would tend to make any practices that postpone returns less attractive and any plans that rearrange the use pattern in favor of current production more attractive; in other words, an increase in interest rates would make depletion more profitable while a decline in the interest rate would make conservation more economic, as it would increase the present value of future incomes. Interest rates would have a similar effect through costs; a rise in interest rates would encourage the shifting of costs to the future, whereas a decline in interest rates would make it more desirable to make long-run investments now—thus favoring conservation.

The interest rate that is appropriate for discounting for one farmer may not be appropriate for another for several reasons. Among the more important reasons is the fact that capital position, available credit and alternative opportunities for farmers vary greatly. The appropriate discount rate for a farmer with large capital reserves is whatever rate of interest he could get if he were to invest his money in government bonds or other securities. For the man who can borrow easily the appropriate rate may be what he has to pay for money he borrows. The rate at which a farmer who is short of capital and has only limited credit available, should discount, is the rate that these limited funds could earn in some other use. For example, if a $100 investment could earn 20 per cent if invested in livestock, future returns from conservation practices would have to be discounted at 20 per cent. On that basis, $100 of income five years hence would have a present value of only $40; a $100 of income 10 years hence would be worth only $16 today. Obviously, individuals who can invest their funds in other parts of their business and expect a 20 per cent return on them need very high future returns on investments in conservation if such investments are to be economic.

Then, too, the discount rate is affected by the needs of the farm family now as compared to the future. Some people may have very low time preferences; income at some future time is worth almost as much as additional income now. But how about the young couples just setting up housekeeping? Many of them would place a high value on modernizing the home and equipping it with appliances and furniture. They might have a very high time preference; they would be willing to sacrifice considerable future income in order to have a little additional income now.

Uncertainty as to the future also affects the value farmers place on different patterns of resource use over time. At the time a farmer makes his plans he does not know what the future holds with respect to prices, weather and many other factors. This uncertainty becomes a cost in the sense that usually it calls for precautions that would not be necessary if future events were known. For example, terracing is made more effective by decreasing the vertical spacing and increasing the number of outlets; both of which increase construction costs. Wider spacing and fewer outlets may provide adequate protection on a particular field under normal conditions, but a severe rain

[1] $\text{Present value} = \frac{\text{Income (n) years from now}}{(1 + \text{discount rate})^n}$

storm might wash out these terraces and cause greater damage than if no terraces had been built. As it is not known when or even whether a rainstorm will occur, some farmers "play it safe" and invest in a more expensive structure than they may ever need.

Uncertainty as to the future also causes many farmers to discount future benefits. Most farmers would prefer a definite income next year to an income that is likely to be somewhat larger, but is uncertain. This discounting of future income for uncertainty has the same effect on their present value as does discounting for time preference. Discounting heavily for both time preference and uncertainty may make an income of almost any size several years from now seem unattractive as compared with a certain income now.

This is not to say that estimation of the economic effects of conservation farming is futile. Rather, it means that economic analysis that will be helpful in telling a farmer what is the best conservation plan for him must be tailor-made for his situation. The farmer himself is the only one who can say how much more $10 in 1960 is worth than $2 in 1955. He must be the judge as to whether $200 invested in a new refrigerator for the home or $200 invested in lime will give the greatest return. But he needs a great deal of technical information to arrive at his decisions, and it is important that the technical information regarding the resource requirements and the yield effects be available to him now for *each* year in his future plans. Average yield response over the next 10 years or the ultimate response in yields from a particular practice is irrelevant information for the farmer who is concerned only with this year's operation of the farm. Even those who take into account longer periods of time in their plans must make decisions this year. Comparison of alternative practices having benefits spread over time requires that the future benefits be discounted to their present values. This is possible only if the year-by-year costs and benefits can be calculated.

One aspect of uncertainty should be emphasized. Suppose that a farmer determines that a continuous corn rotation has a present value of $2 more than a three-year rotation when he discounts the prospective returns for the next 10 years. But suppose also that he recognizes that a continuous corn rotation might conceivably result in serious gullying under severe conditions: If this gullying should occur within the next few years it could mean that gullies would so cut up the field that it would become difficult or impossible to cultivate it. The cost of putting it back into condition for corn might become prohibitive. This possibility, even though remote, might make the farmer uneasy about following the continuous corn rotation. He would like to protect himself against the possibility of such a catastrophe. It might then be economic for him to adopt the three-year rotation if he considered the $2 loss in present value low-cost insurance for the protection it provides.

This is probably the economic justification implicit in most conservation-plan recommendations. A given level of "permissible" soil loss is assumed: holding soil erosion to this minimum is considered adequate guarantee against catastrophic losses. Because many farmers do not want to risk irreparable damage to their fields, they may be willing to accept this minimum permissible level of soil loss as a goal. Their economic decisions then involve only the matter of the least-cost method of obtaining the desired level of conservation. This involves a comparison of the costs and benefits of each alternative. In evaluating alternative practices that provide a given level of protection one must consider benefits in terms of (1) increased crop yields immediately, (2) indirect increases in yields through reductions in soil depletion and (3) the increase in the proportion of high return crops in the rotation that a practice may permit.

The characteristics of soil, rainfall and other factors that influence the effectiveness of various practices in reducing soil erosion and improving fertility are diverse. Because of this, average estimates of the effects of a practice for a region or a state may be of little use in deciding upon the practices or combination of practices that will obtain a given desired level of conservation at least cost. This means that technical information on the effects of various practices and combinations of practices is needed. If such data should become available the individual farmer will need to translate them into economic values in light of his own situation. As mentioned earlier, different farmers will evaluate the physical (or conservation) effects differently, depending upon the length of time they take into account in planning, the rates at which they discount future returns, and the way in which they take uncertainty about future events into account.

Conclusions

In this paper I have tried to emphasize that numerous factors influence the economic values of given physical effects of conservation, which means that any unambiguous statement concerning the economic effects of a practice must be related to a particular set of conditions. This has important implications for researchers, extension workers, farm planners and others concerned with aiding farmers in planning the use of their soil resources. The most profitable level and means of soil conservation must be determined on an individual basis. Thus, if research is to provide useful guides to farm planning, it is important that the results be presented in terms that make them adaptable to the variety of conditions that actually exist on farms. One way in which this may be done is to provide farmers with the physical relationships between various alternatives conservation practices and distribution

of costs and yield effects over time. Given this information, a farmer may be able to decide what is most economic for him in light of his particular cirmumstances with respect to time preference, capital limitations, alternative investment opportunities, ability and willingness to take risks, and length of time he considers relevant in planning the operation of his farm.

Or, research may go farther in providing guides to profitable conservation practices by working out solutions for broad categories of situations. For example, the most profitable conservation plan for farms in a given area may be determined under various assumptions as to the farmers circumstances. One solution may be based on the assumption of unlimited capital reserves, other solutions may be based on assumptions of various alternative investment opportunities. One solution may be based on strong risk oversion; other solutions may be based on lesser degrees of risk oversion. The solution applicable to an individual farm can then be selected by comparing the assumptions underlying the various solutions with the conditions existing on this particular farm.

The economics of conservation practices has been considered here almost exclusively from the viewpoint of the individual farmer. This was done, not because the social costs and benefits of conservation are any less important, but because the decisions concerning conservation on individual farms are made by farmers themselves and farmers are guided in these decisions largely by what they think is most profitable for them. Under our economic system, profits are expected to play a major role in allocating resources among alternative uses and over time in accordance with the desires of society. The fact that some farmers find it unprofitable to follow conservation practices that are economic for other farmers suggests that the general welfare is not always served by individual farmers acting in their own economic interest. Many farmers do not find it profitable to follow soil conserving practices largely because of the kinds of institutional arrangements facing them. Many would practice conservation if it were easier to obtain credit for conservation investments at a low rate of interest; this would cause them to discount future benefits at lower rates. Longer term leases or other assurances that they would remain on the same farm for longer periods would increase the time span covered in the plans of many farmers and thus encourage conservation. More prices and production stability to remove uncertainty as to future incomes would cause many farmers to discount future benefits less. In that way conservation would be encouraged.

Furthermore, it is doubtful that improvement in these institutional arrangements alone will bring about the level of conservation desired by society. Even farmers in the most favorable economic circumstances will not always find it profitable to follow the socially desirable pattern of soil resources use, for many of the social costs and benefits of conservation are not reflected in the private economics of individual farmers. For example, the primary benefit of erosion control programs on farms in a watershed may be on downstream reservoirs. Although the practices are not profitable to individual farmers, the social benefits may outweigh the private costs. Obviously, free market prices cannot be relied on in such cases to indicate the conservation practices desired by society and we cannot appeal to individual farmers to adopt such practices on an economic basis, without subsidies.

Determining Surface Runoff from Watersheds

(*Continued from page* 131)

graph is compared with the amount of surface flow computed from the soil-water routing study.

When the individual hydrographs of the three kinds of flow are compared with the hydrograph for the total flood, it is evident that surface runoff makes the greatest contribution to the peak. Because of the time lag associated with percolation of water through the soil, the peak flows of underground water do not occur until after the surface runoff peak has passed. The peak of the ground-water flow does not occur until the stream is approaching normal flow and so its contribution to the total flood is relatively small. The subsurface flow peaks between the times of the surface and the ground-water flows. Its contribution to the total flood peak is substantial, but still much less than that for the surface runoff. The subsurface flow makes the greatest contribution to the bulk or volume of the flood after the highest stages have passed.

Summary

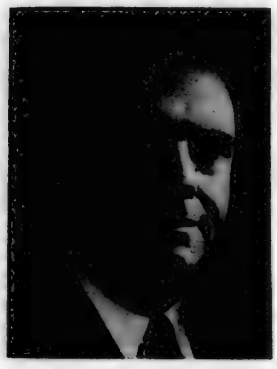
The watershed manager achieves his objectives in waterflow regulation by manipulating the areas of the various soil, use, cover complexes, thus changing infiltration and percolation rates of water in the soil and the consequent flows of surface, subsurface and ground-water. To estimate the degree of regulation that he may expect from a land management program, he needs only to calculate the percentages of total precipitation that will occur as surface and subsurface flow under the new regime, add them together to determine total stream stage, and then make a comparison with present conditions.

Professional Improvement, the Key To a Sound Conservation Program

Technical Efficiency at a Premium

By Don A. Williams
Soil Conservation Service

TODAY, HIGH TECHNICAL efficiency is at a premium in almost any field of endeavor you can name. It is especially true in soil and water conservation work because the demands on conservation technicians are increasing both in volume and in complexity. The work load gets heavier as our limited forces of trained conservationists try to meet the needs of a growing number of soil conservation district cooperators *(nearly one and one-half million)*, as watershed conservation projects gain momentum, and as more and more technical assistance is sought in conservation cost-sharing programs.



These demands upon soil conservation technicians increase in complexity as new and broader fields of technology are brought into play in fitting practices and land use measures to the needs of the soil and to the desires and objectives of the farmers and ranchers. Conservation is not just good farming. All the "good farming" we did before we launched a sound national conservation program in this country did not keep us from damaging and depleting our soils to a dangerous degree.

Thus, to insure value received for the farmers' and the government's dollar spent, technical soundness in conservation planning and treatment is absolutely essential. It is imperative.

And, to have a program that is technically sound, it is of utmost importance that every individual technician working in this field be given, and seek, every opportunity to keep abreast of the newest and best information in the sciences and skills which make up the technology of soil and water conservation.

This means that every administrator and every supervisor must give high priority to training, to the professional improvement *of the men and women who carry out this vital task of planning and assisting in the protection and improvement of our nation's soil and water resources.*

That training job requires more, too, than merely a program of teaching techniques. We must, in addition,

(*Continued on page* 141)

Professional Responsibilities Are Great

By Richard E. McArdle
U. S. Forest Service

THIS IS THE NINTH annual meeting of the Society. I think our Society is in good, sound condition. We are growing in membership and developing in professional maturity. We should take much satisfaction in this progress.

But we must on no account be content with the progress we have made thus far. I made a distinction, you see, between the pride and satisfaction we should have in solid achievement and in being content with that much progress. Along about this time in the life of many relatively new organizations there may come a period when the members of an organization begain to lose some of the zeal and crusading spirit that got the organization off to a flying start. I see no signs as yet that our Society is entering such a critical period, and I hope we never will. But it definitely is something to keep in mind and guard against.

I think also that as we grow in number of members we need to grow also in our concept of professional responsibility and to make sure that new members understand their professional responsibility. Here the Society has a part to play. We must never let ourselves drift to the point where we take for granted the need for this Society.

We are deeply involved in the future welfare of our country because we deal with land and water resources. We have responsibilities to our fellow man and to our country. We must meet those responsibilities. More than we may realize, other people depend on us.

I believe this Society can help us to meet these responsibilities. I don't mean that just having a Society will automatically achieve those objectives. But a vigorous, live-wire, genuinely professional Society can provide the machinery to help us do so. It can, for example:

- Bring us together to facilitate and hasten the exchange of technical knowledge—and this is important because soil and water conservation involves not one but many professions.

(*Continued on page* 141)

Technical Efficiency

(*Continued from page* 140)

encourage and inspire conservation workers to seek their own avenues of professional improvement. This is a matter of developing an attitude on the part of conservation workers—an attitude that leads us to steadily raise our technical standards and then equip ourselves to meet those standards.

All this is why, as an administrator of a large force of technical workers in conservation, I am so vitally interested in the existence and the work of the Soil Conservation Society of America and in other professional societies. In this Society—in its chapter meetings, in its fine annual gatherings, and month by month in the pages of its JOURNAL, conservation workers have that privileged opportunity to share experiences and to learn and pass along new findings and evaluations. Most important of all, it is the means by which we all receive the inspiration that comes from the knowledge that we are not working alone in this tremendous task—that there are many others with similar problems, similar devotion to the cause, and with a common determination to bring to this task the best that the human mind and body can devise for the good of mankind everywhere.

Professional Responsibilities

(*Continued from page* 140)

- Stimulate increase in technical knowledge through competition and otherwise.
- Raise the standards of professional competence and ethical conduct—people must have confidence in us.
- Provide a means to stand together and work together toward desirable objectives so that the force of many individuals can be harnessed as one big force.
- Give us an effective way to promote understanding by people whose understanding and support are essential to wise land use.

Thus, this Society can and should be a means to achieve better use of renewable resources by those immediately and directly concerned. And it can be an effective stimulus to all the sciences and professions involved in conservation of these renewable resources so that increasingly we can do a better job and the Society can be a means of bringing before all the people of the United States their personal, individual need for seeing to it that the nation's soil is wisely used. They must do this because their very lives depend on wise land use even though they may live a long way from the land.

So, as we round out the first decade of our existence as a professional society, let's pause just a moment to consider two things:

1. The nation needs something like our Society, whether under this or some other name, and we can take justifiable pride in being members.

2. Let us give a lot of thought to how together, as a Society of professional caliber, we can serve our country by doing a better, more effective job in handling the land so that our basic necessities of life will continue to be produced.

This Society can be a potent factor in the welfare of this country. It's up to us to make it so.

Basic Objective and Over-all Philosophy Committee Report of the SCSA

This committee recommends that the Council of the Soil Conservation Society of America consider the desirability of taking the steps necessary to get membership approval to change the basic objectives statement as stated in Section I of the Constitution to read as follows:

The objectives of this Society shall be to promote and advance all phases of the science of conservation of soil and water resources; to provide a medium for the exchange of facts, experience, and thoughts; and to represent, advance, and protect the standards of the basic and allied sciences of soil and water conservation. Specifically, this Society will:

1. Champion the several arts, sciences and professions that have to do with the conservation of our renewable natural resources in such a manner as to encourage sound formulation of the best possible system of land and water management within land and water capabilities and the principle of multiple use.

2. Vitalize understanding of the need for conserving our renewable natural resources to the end that conservation becomes an intimate part of the thinking, doing and living of city and country people alike.

3. Foster more intensive study of the means by which greater skill in the management of land and water can be developed and put into practice as rapidly as possible.

4. Strive for early adoption of high ethical standards on the part of all those who are professionally engaged in the furtherance of improved use of land and water.

5. Work with other conservation agencies and organizations in support of their recognized resolution and purpose.

6. Work for the early adoption of a long-range, country-wide land and water policy as a guide to all agencies, organizations and individuals in their renewable resource conservation activities.

7. Proclaim noteworthy achievements by individuals, agencies and organizations that have assisted in the development of sound concepts and practices in land and water use.

8. Provide a continuing medium for joint consideration of and undertakings in movements designed to foster more effective consideration of renewable natural resources.

9. Publish and encourage publication of constructive literature that will aid in the development of improved concepts and practices in conservation.

10. Work for an enlarged research program designed to contribute toward a better understanding of the means by which more effective conservation methods can be developed and put into practice.

11. Promote rapid development of improved educational programs on conservation in elementary and secondary schools, in colleges and universities, and in adult education fields.

12. Inspire public recognition of the urgent need for a complete country-wide inventory at the earliest possible date so that more rapid progress may be made in getting more land used within its capabilities.

13. Strive for rapid understanding of concepts of the importance of world-wide conservation of renewable natural resources as one of the most important steps toward permanent peace.

14. Augment the concepts of conservation so they include not only better use of soil, water, grass, forest and wildlife resources in the economy of the world, but aesthetic and human values as well.

This committee further recommends that the necessary steps be taken to incorporate at some appropriate place in the Constitution the following statement designed to express the philosophy of the Society:

The Soil Conservation Society of America is dedicated to the promotion and advancement of renewable natural resources conservation to the end that water, soil, grass, forests, and wildlife, in abundance, may be used and enjoyed by mankind forever. The Society is founded on the knowledge and belief that these renewable resources are indispensable to the support and growth of strong, prosperous, free nations; that they are interrelated and interdependent —inseparable one from the other; and that their everlasting abundance is dependent on the development, coordination and proficient application of the several arts, sciences, and professions dealing with the promotion of good resource management. Toward the early attainment of this goal, the Soil Conservation Society of America pledges the direction of its energies and facilities.

The committee further recommends that this philosophy statement be made available in form of an illuminated scroll and that individual members, chapters and the home office be encouraged to display the philosophy declaration at appropriate locations and otherwise publicize it within the limits of good taste, as opportunity presents itself.

As a final recommendation, this committee urges that a canvass be made of the purpose, scope and authority of existing committees to determine what additional committees should be created to fully activate the specifically enumerated objectives and to vitalize the sense of the philosophy statement.

J. K. VESSEY, *Chairman*
EDWARD H. GRAHAM
CYRIL LUKER
CHESTER S. WILSON
LLOYD E. PARTAIN
PHILIP E. ALLAN

EDITOR'S NOTE: *See the resolution on page 144 regarding the report of this committee.*

The fault (in conservation education) lies in our inept packaging of the product. We haven't gotten the word across in terms the public can understand. To be sure, we have been preaching the gospel—but in our own language on a "take it or leave it" basis. In general, the public has "left it," and we have occupied ourselves by talking to ourselves. Whom are we to blame for this impasse—the public? No! The public is a sleeping giant with unlimited potential for action. When the right stimulus is applied—repeatedly—the giant can be awakened and its potential for good realized. That the "giant" still slumbers is our fault. We haven't applied the right stimulus; we haven't succeeded as yet in packaging conservation attractively. We have failed because . . . we have been too busy talking to ourselves in terms only we can understand—or even worse, not talking at all.

—A. W. BROMLEY, *New York*

Soil Conservation Society of America Adopts Resolutions at Jacksonville Meeting

Integrated Watershed Development

Whereas, water has been recognized as the most limited commodity for the further development of the agricultural, industrial, social and economic welfare of this nation; and,

Whereas, sufficient basic information exists or can be obtained for suitable planning and action for integrated water and watershed development programs, watershed by watershed,

Be It Resolved That the Soil Conservation Society of America request local, state and federal agencies to support a fully integrated program of water source inventory, water use needs, and action programs that will

1. Promote upstream watershed protection, soil and water conservation, vegetative measures including reforestation, provision of recreational areas, and other integrated land and water use measures.
2. Provide proper impoundment and stream flow regulation for industrial and domestic needs.
3. Retain a suitable water table level, and
4. Provide for distribution of water supplies in keeping with the needs of the land and the people.

Be It Further Resolved, *That such a fully integrated watershed development program be planned and carried out under the direction of locally organized groups of rural and urban people, corporate or otherwise with local, state and federal agencies cooperating.*

Expansion of Watershed Management Research

Whereas, problems associated with water supply, floods, soil erosion and sedimentation continue to face all parts of the country, and the continued growth and strength of this country will be influenced greatly by the early and proper solution to these many problems; and

Whereas, most major rivers of the country derive the main part of their waterflow from the forest, and range and farm lands of the watersheds, including their mountainous headwaters; and,

Whereas, all such lands are important for other uses such as timber production, forage and crop production and wildlife, and recreation; and,

Whereas, studies that have been carried on in various parts of the country indicate that uses of these lands can and should be so modified as to insure protection of and realization of the full potentials of the water resources;

Now, Therefore, Be It Resolved, *that watershed management research be expanded to a degree commensurate with the importance and urgency of the existing problems, in order to insure that all lands watershed by watershed contribute to the maximum well-being of our country.*

Rehabilitation of Western Range and Watershed Lands

Whereas, vast areas of publicly-owned mountain, forest and range lands in the West are important as (1) a source of forage for the western livestock industry, (2) vital watersheds, (3) the habitat of millions of big game animals, and (4) scenic recreational areas of national significance; and,

Whereas, much of this range is in a deteriorated condition and requires rehabilitation in order to meet the forage needs of livestock and expanded big game herds, and to provide critical watershed protection; and,

Whereas, administrative agencies are inadequately equipped to improve these ranges, and need additional basic information on game-livestock inter-relationships in order to resolve conflicting interests and to manage these multiple-use lands most efficiently;

Now, Therefore, Be It Resolved, *that the Soil Conservation Society of America favors an adequate federal rehabilitation program on federal lands through reseeding or other practices, and an expansion of research on the basis management requirements of the various forage types, and on inter-relationships between livestock and big game in sound range management.*

Sustained Yield on National Forests

Whereas, appropriate land use involves soil and water conservation and embodies proper utilization of the products of the land in accordance with its capabilities; and,

Whereas, the planning and carrying out of a full integrated land use as described above in most cases should be on a watershed basis; and,

Whereas, to maintain production of forest products at levels required to meet the nation's demands, it is essential to obtain full sustained yield harvesting at steadily increasing intensities of management from the 73 million acres of commercial timber lands of the national forests; and,

Whereas, the requisite measures are: (1) personnel for sales preparation and administration of the full desirable cut, (2) construction of a system of roads for timber hauling to open up areas now inaccessible, (3) adequate protection of mature timber and growing stock from fire, insects, disease and rodents, (4) improvement and salvage cuttings to place stands in good growing condition, to stop losses and to harvest deteriorating timber, and (5) reforestation and related cultural measures on deforested and understocked areas:

Therefore, Be It Resolved, *that the Soil Conservation Society of America favors speeding up the application of these measures.*

Protection of the Public Land Values

Whereas, the Public Lands are managed to protect watersheds, produce timber, and make available to the people of the United States recreation and all other resources of these lands; and,

Whereas, the Soil Conservation Society of America recognizes the importance of minerals in the nation's economy, but objects to those provisions of the U. S. Mining Laws which allow a person making a valid mineral discovery to obtain necessary rights to the land without any other value of the land; and,

Whereas, many methods of mining, particularly strip mining, are destructive to soil and water resources;

Now, Therefore, Be It Resolved, *that we favor (1) limiting claims located on Public Lands to the mineral rights and such surface resources and uses as are needed in the development of the claim or in the extraction or removal of the mineral deposits; (2) requiring recordation of all claims; (3) reserving to the United States the use and disposition of the surface resources that are not in conflict with the mineral development; (4) amending the U. S. Mining Laws so as to adequately protect the public interest in public lands without interfering with the legitimate prospect for and development of minerals.*

Golden Anniversary of the Forest Service

Whereas, for the past 50 years the Forest Service, U. S. Department of Agriculture, has been a leader in the conservation of all forest resources; and,

Whereas, that leadership has made the national forests outstanding examples of well-managed public forests; has helped strengthen state forestry agencies, has encouraged and assisted private timber landowners to make great advances in forestry; and, through forestry research, has opened the door to even greater forestry programs; and,

Whereas, February 1, 1955, will mark the 50th Anniversary of the establishment of the Forest Service by the American people,

Therefore, Be It Resolved, *that the Soil Conservation Society of America hereby salutes the Forest Service as a public conservation agency dedicated to the ideal of the greatest good to the greatest number of people in the long run.*

Basic Objectives and Over-All Philosophy of the SCSA

Whereas, a study committee of the Society has worked diligently for several years on this important and fundamental matter, and

Whereas, the Council of the Soil Conservation Society of America recommends the adoption of these Basic Objectives and Philosophy, and

Whereas, its adoption involves a revision of the Society's constitution *(Section 1),* now

Be It Resolved, *that the membership approve and adopt this report and hereby authorizes the Council to make it effective in accordance with proper procedure.*

WATER! By The Education Committee. *Texas Society of Professional Engineers, Nash Building, Austin 1, Texas. 67 pages, illustrated. 1954. $1.50*

This very fine publication coming from a group of professional men in fields other than conservation is not only unusual, but refreshing and factual. It is a plain statement of some of the problems involved in the development of Texas water resources, including some recommendations for their solution.

In addition to the summary and recommendations, the report contains excellent discussions covering "Rainfall-Runoff Relationships," "Surface Mapping," "Cordinating Water Developments," "Legal Problems," "Financial Aspects" and other topics equally important. Each subject is well presented and includes a great deal of information which should be extremely valuable to those responsible for the formation of water policies.

NORTH AMERICAN PRAIRIE. By J. E. Weaver. *Johnson Publishing Company, Lincoln, Nebraska. 348 pages, illustrated. 1954. $5.00.*

North American Prairie by Dr. J. E. Weaver, professor emeritus of Plant Ecology, University of Nebraska, is a book of rare quality that men in every branch of conservation work should own and read. It is indeed a *"Book of Revelations"* about our American prairie that contains much valuable knowledge and many sage solutions to problems confronting both landowners and professional conservationists.

Highlights of Weaver's 40 years of researching in grasslands are presented in this extraordinary book that unfolds both the surface and underground secrets of the prairie. Weaver has the rare genius for bringing the drama of nature into view. Disney has shown the possibilities of Nature's drama through his elegant movies of the desert and grasslands. Weaver, also, has captured the latent drama of prairie and has presented it through the medium of eloquent descriptive writing and sharp story-telling black and white pictures.

There are about 200 photographs and drawings, all works of art, which convey many interesting lessons, and these are worth more to the reader than the book costs. A comprehensive list of grasses, forbs and shrubs that inhabit the prairie is described. The virgin prairie is discussed, and vivid descriptions about its settlement, degeneration due to plowing, grazing, fire and drouth plus its recovery following drouth and lighter grazing, are included.

This book is easy to read. The print is large; quality of paper is excellent; paragraphs are short and the chapters are subdivided regularly with topic headings in bold print.

Dr. Weaver has about exhausted every artful device known to reveal his scientifically-based subject matter to a reading audience which will include groups from high school students to scientists.

Weaver concludes this fine book in a reflective mood with this eloquent quote with its meaningful theme: "Grassland soils through untold centuries have been thoroughly protected by the unbroken mantle of prairie vegetation. The vegetation and soil are closely related, intimately mixed, and highly interdependent upon each other and upon climate. Hence prairie is much more than land covered with grass. It is a slowly evolved, highly complex organic entity, centuries old. It approaches the eternal. Once destroyed, it can never be replaced by man."

—B. W. Allred, Washington, D. C.

REVIEWS OF RESEARCH ON ARID ZONE HYDROLOGY. By Various Authors. *UNESCO, Paris, France, and Columbia University Press, New York. 1953. 212 pages. Maps. $5.50.*

A broad attack on the land and water problems of the arid zones of the world was launched by the United Nations Educational, Scientific and Cultural Organization in the establishment in 1950 of an International Arid Zone Research Council. First in a series of publications sponsored by the council is this volume of *Reviews of Research on Arid Zone Hydrology.*

For convenience, the council divided the arid areas of the world into eight regions, and commissioned experts to write reports on each, reviewing the research carried out on hydrology, especially as it pertains to underground water and fluid mechanics. After appropriate review by international authorities, the reports and maps were authorized for publication.

The areas receiving separate treatment are northwest Africa, northeast Africa, Union of South Africa and Angola, the Middle East, India and Pakistan, the United States and Canada, Latin America, and Australia. Each report presents a description of the arid areas of the region, a discussion of the underground water resources and problems in water utilization, a review of the available research on hydrology and related subjects, and a bibliography of important publications.

As might be expected of separate reports by different authors on different regions, the treatments are very uneven in factual content, thoroughness and style. Much of this, no doubt, is a reflection of the degree of advancement in hydrological research in the different parts of the world.

One of the most significant contributions of the study is a map and report on "World Distribution of Arid and Semi-Arid Homoclimates," by Peveril Meigs. He employs an adaptation of Thornthwaite's 1948 classification, which uses an index based on the adequacy of precipitation in relation to the need of plants. In general terms, the author defines arid areas as "those in which the rainfall on a given piece of land is not adequate for crop production. In the semi-arid lands, rainfall is sufficient for certain types of crops, and grass is an important element of the natural vegetation unless overgrazing has replaced it with brush."

The maps show that a much greater proportion of the land area of the Eastern Hemisphere than of the Western is arid or semi-arid. In fact, the author points out that the North Africa-Eurasia dry province is larger than all the remaining dry areas of the world combined.

With this in mind, the reader is likely to be all the more impressed to find that the report on the relatively minor arid areas of the United States and Canada contains the most information on the principles and mechanics of hydrology and related subjects. This section lists 424 research publications, the greatest number for any of the eight regions.

Although the text is mostly descriptive, a close second in the number of publications listed is the report on Australia, a continent with a predominantly dry climate. Considerable fundamental research is indicated from the India-Pakistan area, which follows closely in the number of publications cited.

The book should be of great value as a broad survey of the state of knowledge on the water problems of the dry areas of the world. The exhaustive listings of research publications should be helpful in putting workers in one area in touch with significant contributions from other parts of the world.

Forthcoming publications in the same series, listed on the dust jacket, are *"Proceedings of the UNESCO-Turkey Symposium on Arid Zone Hydrology," "Directory of Institutions Engaged in Arid Zone Research,"* and *"Reviews of Research on Arid Zone Plant Ecology."*

—BEN OSBORN, *Midland, Texas*

Classroom Activities Related to Natural Resources. BY EDGAR L. WIGHT AND A. GOLDEN KILBURN. *Department of Interior, Bureau of Indian Affairs, P. O. Box 345, Brigham City, Utah.*

School teachers who are looking for ways to show right in the classroom what soil erosion is, how soil is formed, the benefits of soil organic matter, and many other activities concerned with the conservation of natural resources, will welcome this booklet. The authors had the teacher in mind when they put together this treasure chest of activities for classroom use.

Consisting of 40 pages, 8 by 10½, in attractive multilith, this booklet contains 90 separate activities, each illustrated with a simple drawing.

It is organized into four sections. The first section contains 48 activities relating to soil and water. Some of the demonstrations are: *"Rocks may be worn thin by friction," "Chemcial action decomposes rocks," "Heating and cooling helps to break up rocks," "Plants take minerals from the soil," "Roots hold soil in place"* and *"Make some humus."*

There are 18 activities described and illustrated in the second section which deals with **"Demonstrations Relating to Plants."** Some of the activities described are *"Roots seek water," "Examine a leaf"* and *"Study the growth of plants."*

The third section, consisting of activities related to air, weather and climate, contains 13 activities. A fourth section deals with fish, wildlife and microscopic life and contains 13 activities.

Each activity is classified as follows according to the grade level for which it is best suited: Primary grades, intermediate grades, junior high school, senior high school and adults.

The booklet is specifically designed for teachers and students who wish to make an active study of the relationships of soil, water, plants, rocks, microscopic life and wildlife, to the human race. The activities are selected to help the teacher and class begin a project without too much equipment and preparation.

Classroom Activities Related to Natural Resources was prepared as a joint publication by U. S. Department of Interior, Bureau of Indian Affairs and Utah State Agricultural College, originally for circulation to the various Indian schools in the United States and Alaska.

—A. B. FOSTER, Milwaukee, Wisconsin.

Fundamentals of Ecology. By EUGENE P. ODUM, *W. B. Saunders Company, West Washington Square, Philadelphia 5, Pennsylvania. 384 pages with 119 figures. 1953. $6.50.*

This book, as pointed out by the author, has two purposes: To serve as a textbook in a college course, and as a reference for conservationists, sanitary engineers and others concerned with applied ecology. The book is extremely well organized and contains many excellent illustrations and charts. The subject matter is presented in

a concise and simplified manner thereby making it easily understood by those interested in ecology.

The author has drawn on his own teaching experiences for successful methods in presenting the subject field of ecology. In so doing he covers the *"principles"* and *"environmental"* approach as the basis of the book. In Part One basic principles covering truths and concepts which have wide application are grouped under logical headings. Part Two of the book develops the field and laboratory aspects of the work.

Part Three deals primarily with practical applications as well as borderline fields. As is true in most instances, a worker learns most of the necessary details in the actual practices of his work and from other sources having a bearing on his interest. This section of the book also gives the young student an opportunity to learn more about professions open to a trained ecologist.

The Lost Villages of England. BY MAURICE BERESFORD. *The Philosophical Library, Inc., 15 East 40th Street, New York. 445 pages, illustrated. 1954. $12.00.*

The author of this book is Lecturer in Economic History in the University of Leeds, Great Britain. He spent many years in studying existing villages in the English countryside; also the sites of many others which have not been fortunate enough to survive, though six hundred years or so ago they were little different from their neighbors. Mr. Beresford has located these lost villages, and described the occasion of their depopulation, and the character of those who destroyed them.

His book is an important contribution to economic history and historical geography, as well as a guide-book to an unexplored part of the English landscape. Some of the reasons advanced as to why these villages were lost may have a bearing on the rise and fall of communities in America confronted with the depletion of land resources.

Sagebrush Burning—Good and Bad. FARMERS BULLETIN 1945. *Office of Information, United States Department of Education, Washington, D. C. 36 pages. Illustrated. 1955.*

This bulletin is a summary of a study made by the Forest Service in cooperation with the Fremont County Woolgrowers Association and the State of Idaho since 1932. It is designed to help the stockman use fire successfully in improving sagebrush range by explaining where, when, and how to burn and pointing out pertinent "DO NOTS" in burning.

Planned burning followed by grazing management has increased the grazing capacity of the range by up to 300 per cent in some places, the bulletin shows. Sagebrush prevents the production of good forage and interferes with grazing and travel of livestock over the range.

The haphazard burning of sagebrush followed by poor management, as frequently practiced, reduces forage production and grazing capacity, increases soil erosion possibilities, and permits rapid re-invasion of sagebrush. One of the biggest factors contributing to the failure of burning in improving the range is improper grazing after burning. The bulletin discusses care of the range after burning.

Seeding Rangelands in Utah, Nevada, Southern Idaho, and Western Wyoming. HANDBOOK No. 71. *Superintendent of Documents, Government Printing Office, Washington 25, D. C. 30 cents.*

The theme of this publication emphasizes the fact that 20 million acres of wild lands in the Intermountain Region of this country should be reseeded for greater forage produce for livestock grazing and for better watershed protection and soil stabilization.

The handbook, prepared by the Forest Service, is based on a 20-year study in which numerous ranchers, state and other federal agencies also participated.

To help individuals meet this reseeding need, the handbook brings together the best information available. It explains the most successful species to plant on different sites, best seasons and rates of planting, pre-planting preparation, methods and equipment for seeding, and care required to establish and maintain good range after seeding.

Altogether 56 different plants are discussed, including 36 grasses, eight legumes, seven other broadleaf herbs for special uses, and five forage shrubs. In addition the handbook gives specific guides for seeding the more important sites and problem areas in the region.

Some Factors Which Effect Change in Natural Resource Conservation Education: A Study of the Program of the Education Division, Michigan Department of Conservation. *Abstract of dissertation submitted in partial fulfillment of the requirements for a Ph.D. degree. By* GILBERT BANNER, *University of Michigan, Ann, Arbor, Michigan.*

The purpose of the study is to determine the factors of behavioral change that are involved in achieving the program objectives of the Education Division, Michigan Department of Conservation.

The teacher training program offered at Higgins Lake, at the department's in-service training facilities, is examined as a representative Education Division activity.

The problem of behavioral change is approached from the standpoint of the conservationist concerned with bringing about changes in knowledge, understanding, perception, and attitude on natural resource problems and the need for teaching natural resource conservation in the public schools. It is approached from the educator's view-

point that examines the implications of these conservation objectives for change in the curriculum of the Training School and change in the "back-home" curriculum environment of program participants.

The program at the Higgins Lake Training School is examined by means of observation, interview, and questionnaire of staff members and participants in three program areas: conservation content, presentation procedures, and group procedures.

Since program objectives are not in all cases explicit, a frame of reference is established to which program activities are compared. This framework is appropriate for examining learning in informal groups. It is based on the activities that are considered successful by other agencies with programs of similar broad purposes. This framework includes: basic principles of natural resource use, elements of individual learning theory, elements of group dynamics, some factors of curriculum change, and some aspect of organization of experiences for teaching.

The Higgins Lake teacher training program is described. This includes the implicit objectives for the protion methods used, and the group procedures practiced. gram, the conservation content presented, the presenta- Nine descriptive characteristics of the program that appear important for reaching objectives are indicated.

Questionnaire data are presented in three parts: First, the highly favorable opinion of participants to the program. Second, the data that substantiates some of the elements of the nine characteristics. Third, the dynamics that appear to underlie the opinions expressed by the participants.

Willingness to make a commitment to improve conservation teaching is taken as an indirect measure of the success of the program. The underlying factors that appear related to making this commitment are examined.

Several areas of policy decisions on administrative and teaching procedures are examined that appear to underlie program characteristics. The nine characteristics are examined in detail in terms of the associated administrative and teaching problems. Causal relationships to policy decisions are discussed. Appropriate action to change each of the nine characteristics, if change is contemplated, is suggested.

Finally, this study presents some administrative problems inherent in a state conservation education division, and describes the several levels at which policy affecting its activities, is made.

The study explores the areas of educational responsibility that are being established through empirical practices in state administration.

The need for a single state policy on conservation education is indicated to which the Education Division and all interested agencies can coordinate their efforts.

Utilization of Saline Water: Reviews of Research on Problems. *Columbia University Press, 2960 Broadway, New York 27. 1954 $1.75.*

This publication has been prepared in accordance with the objective of promoting the coordination of research on scientific problems concerning the arid zone and the humid tropical zone by collecting and disseminating information on current research and assisting the implementation of projects that form part of a systematic program of basic research.

The review contains three reports which were commissioned by UNESCO in 1952 on the recommendation of the Advisory Committee on Arid Zone Research at its Second Session. Two of the reports deal with the biological problems of using salt or brackish water, that by Mr. Georges Grillot of Morocco, *French Zone,* dealing with research carried out in Europe, Africa and the Middle East, and that by Dr. H. E. Hayward of the United States of America covering the work done in the Americas, Australia and India. The third report reviews research on the purification of salt water, and is by Dr. Everett D. Howe of the United States.

The Good Earth — Our Richest Heritage. TEXAS FRIENDS OF CONSERVATION, *Post Office Box 2629, Houston, Texas. 1954.*

The major section of the book is by Arthur M. Smith, chief agriculturist, Mathieson Agricultural Chemicals Company. It introduces *"The Good Earth—Our Richest Heritage,"* describes what soil is, the origin of soils, soil texture, structure, tilth, moisture and the composition of soils. Soil conservation and related problems are outlined. This section closes with a page of references.

The second section on *"Increase Production by Practicing Conservation"* is by Dooley Dawson, vice president-manager, Agricultural Department, The Second National Bank of Houston. This section discusses soil conservation and improvement on cultivated lands, pastureland and woodlands.

The third section discusses *"Water—Our Most Important Renewable Resources."* It is by Paul Weaver, who has served as vice president of the Texas Academy of Science and as a consultant in the works program of the schools of Texas and in cooperation with the Texas Fish and Game Commission. This section discusses how we get our water, the hydrologic cycle, conservation and use of water.

This book is illustrated with interesting pictures, is well outlined and set up for easy reading. It should be particularly useful for students at the high school level and their parents in studying and better understanding *"The Good Earth—Our Richest Heritage"* and means of conserving and improving our soil, water and forest resources.

New Frontiers in Colorado Agriculture. *Published by Colorado State Soil Conservation Board, Denver, Colorado. 16 pages, illustrated. 1954.*

A descriptive brochure of Colorado's pioneering efforts in the development of the renewable natural resources. It is well illustrated and highlights research, education and the practical application of good land use, irrigation and farm management practices.

Resource Publications of Interest

Role of the Farmer in Upland Game Production and Hunting. By W. L. SLOCUM AND L. T. EMPEY, *Bulletin 552, July 1954.* Washington Agricultural Experimental Station, Pullman, Washington.

The Morphology, Mineralogy and Genesis of Two Southern New England Soils. By G. A. BOURBEAU AND C. L. W. SWANSON. Bulletin 584, June 1954. The Connecticut Agricultural Experiment Station, New Haven, Connecticut.

Annual Review of World Production and Consumption of Fertilizer. - 1954. Prepared By G. W. COOKE, Food and Agriculture Organization, Columbia University Press, International Document Service, 2960 Broadway, New York, 27. 105 pages. 1954. 50 cents.

The Forest Resources of New Hampshire. FOREST RESOURCE REPORT *No. 8* Forest Service, U. S. Department of Agriculture, Washington, D. C. 40 pages, illustrated. 1954. 45 cents.

Fish Conservation Fundamentals. By E. W. ESCHMEYER, Sports Fishing Institute, Washington, D. C. 1954. 25 cents.

Annual Report for 1954. Division of Forestry Relations, RICHARD KILBOURNE, *Director.* Tennessee Valley Authority, Norris, Tennessee. 34 pages, illustrated. 1954.

Fisherman's Handbook - 1955. Edited By GEORGE S. FICHTER. The Fisherman Press, Inc., Oxford, Ohio. 512 pages, illustrated. 1955. $1.25.

Helpful Booklets From Advertisers

We are, in cooperation with our advertisers, listing booklets printed by them which will be of interest to you in your work as a conservationist. The booklets are free and may be obtained by checking the squares and filling in the form below. This information should be forwarded to the Soil Sonservation Society of America.

☐ PORTABLE ALUMINUM IRRIGATION SYSTEMS INSURE YOUR LAND AND CROP INVESTMENT YEAR AFTER YEAR. *Food Machinery and Chemical Corporation, Florida Division, Lakeland, Florida.* An illustrated brochure covering Shure-Rane systems with detachable couplers and Lockjoint with factory attached couplers.

☐ BUILD FERTILITY IN LAND WITH COMPLETE CONSERVATION PROGRAM FOR GREATER PROFITS. *Servis Equipment Company, 1000 Singleton Blvd., Dallas, Texas.* An economic analysis of the Clinton Harbors' Farm near West Point, Texas, showing how the net income per acre and fertility in the land was increased.

☐ FERTILIZER APPLICATION GUIDE FOR MAJOR FIELD CROPS. *New Idea Farm Equipment Co., Coldwater, Ohio.* A 42 page illustrated booklet on how to get the most from your fertilizer dollar.

☐ PIONEERS OF PROGRESS. *Minneapolis-Moline Company, Minneapolis, Minnesota.* A 32 page cartoon history of agriculture in America from 1620 to today.

☐ FUN ON THE FARM. *Minneapolis-Moline Company, Minneapolis, Minnesota.* This is a 24 page coloring book of farm scenes for children.

☐ U. S. FOOD FACTORY. *International Harvester Company, Chicago, Illinois.* A 48-page booklet showing how population increase puts pressure on farmers and ranchers for more production. Covers all phases of conservation, illustrated.

☐ MAKING PAYDIRT LAST. *Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin.* 16 pages, illustrated, covering the subject of practical conservation methods for all acreages whether large or small. It shows how modern farm equipment can be used for practical soil conservation work.

☐ WHY LEVEL? *Eversman Manufacturing Company, Denver, Colorado.* A discussion of the application of the leveler to all types of farming conditions and the leveler application to soil conservation practices.

☐ LAND SMOOTHING . . . KEY TO ORDERLY WATER DISPOSAL. *Eversman Manufacturing Company, Denver, Colorado.* An article covering the use of land levelers for both irrigated farming conditions and as a drainage practice in the humid areas.

☐ ONE EQUALS FOUR (PASTURE MANAGEMENT). *J. L. Case Company, Racine Wisconsin.* A treatise on modern methods for permanent pasture lands in the eastern half of the United States and Canada.

☐ LAND OF PLENTY. *Farm Equipment Institute, 608 South Dearborn Street, Chicago 5, Illinois.* An excellent and well illustrated historical portrayal of the contribution made by the farm equipment industry in farm mechanization.

☐ FUEL-WISE. *Minneapolis-Moline Company, Minneapolis, Minnesota.* A handy system of figuring fuel costs for gasoline, LP gas, and diesel engines.

☐ TRIED AND NEW IDEAS FOR HANDLING BARNYARD MANURE. *New Idea Farm Equipment Co., Coldwater, Ohio.* A thorough but compact illustrated booklet on profitable ways of handling barnyard manure.

☐ LAND GRADING AND SMOOTHING FOR LAND DRAINAGE. *Eversman Manufacturing Company, Denver, Colorado.* An outline of how the individual farmer, with regular tractor, can prepare his fields to achieve surface drainage.

☐ MARCHING AHEAD WITH CORN. *New Idea Farm Equipment Co., Coldwater, Ohio.* The history, present role and future of a vital crop.

☐ GOOD FORAGE - THE KEY TO LIVESTOCK PROFITS. *Massey-Harris Co., Racine, Wisconsin.* A 20 page, illustrated booklet on handling forage. Written by Dr. Gustav Bohstedt of University of Wisconsin.

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Field Notes

These mimeographed reports, developed by the Ohio Forestry Association, cover a wide variety of watershed problems and needs.

Ohio Forestry Association Watershed Plan Designed to Insure Water Supply

Proposals to establish a solid basis for immediate action insuring Ohio's water supply for the future are contained in a Watershed Conservation Plan recently developed by the Ohio Forestry Association.

The reports embody a year's research on the part of six task groups into which the 50-man committee was divided. The 141 pages of text are supplemented by 61 charts and tables detailing the statistics of the state's 14 major watersheds.

The responsible committee was headed by Elliott B. McConnell, vice president for manufacturing of the Standard Oil Company of Ohio. Serving as coordinator of research and editor of the reports was Sherman L. Frost of the OFA staff.

Findings of the committee are summarized in five initial recommendations:

1. Formation of citizens' committees in each watershed to consider local needs and potentialities, to adapt the over-all policy to their own communities, and to spearhead programs of education.

2. Cooperation among state and federal agencies to complete an inventory of water resources, determining within each watershed present water availability, water use and future water needs.

3. Reactivation and broadening of conservancy districts as means of developing, within the watershed, integrated water supply, flood control and drainage systems, and methods of soil and forest management.

4. Scrutiny by a legislative committee of the various public agencies responsible for conservation activities, to determine the adequacy of current programs in relation to the proposed watershed development.

5. Evaluation of present water-use laws to provide for the equitable distribution of available supplies among competing interests.

Forest Service Initiates Watershed Research Program in New Hampshire

The Northeastern Forest Experiment Station of the U. S. Forest Service has inaugurated a program of watershed-management research in the White Mountains of New Hampshire. As a first step, the 7,500-acre Hubbard Brook watershed near West Thornton, New Hampshire, was selected as the experimental area. Lying entirely within the White Mountain National Forest, the Hubbard Brook watershed is representative of the vegetation, soils and topography of the White Mountains. Fifteen to 20 sub-watersheds within this drainage, ranging in size from 100 to 300 acres, will be used for experimental purposes.

Studies will be made to determine the effect of forest type, condition and cutting practices on water yield, distribution and quality. Both plots and watersheds will be employed to obtain results. On a watershed basis, streamflow from experimental watersheds will be gaged during a pre-treatment period and the effect of treatment will be determined from post-treatment gaging by comparing flow from treated and control watersheds.

To find out why and how a forest treatment influences streamflow, and thus facilitate extension of results to other areas, the effect of the treatment on plant-soil-water relations will be studied on a plot basis. In plot studies, particular attention will be paid to the effect of treatments on humus, soil frost and snow accumulation and melt. The influence of logging road location and construction on water quality will also be studied.

Aerial photographs of the entire drainage were made this past fall. Arrangements have been made to map soils, vegetation and geology. With cooperation of the Geological Survey the first stream-gaging installations will be constructed this summer, and a network of rainfall gages will be laid out.

George R. Trimble, Jr., will be in charge of the project and will be assisted by Richard S. Sartz and Robert S. Pierce. This project is a part of the program of the White Pine-Hardwood Research Center, Laconia, New Hampshire, under supervision of Victor S. Jensen.

—H. W. LULL, Upper Darby, Pennsylvania

Emergency Program Established To Check Severe Dust Storms

Representatives of the Soil Conservation Service, Agricultural Conservation Program Service and Commodity Stabilization Service of USDA met with members of the State Agricultural Stabilization Conservation Committees of southern Great Plains states, plus Wyoming and Nebraska, in Denver, Colorado, on March 10 to discuss a cost-sharing program of emergency control measures needed to check wind erosion in that region. The meeting was well timed because a severe dust storm, the worst of the season, occurred on that date.

Reports of SCS showed that about five million acres of farm and rangeland had been damaged by wind erosion between November 1 and February 28, and that an additional two million acres were damaged by the storm of March 10 in the southern Plains (southwestern Nebraska, southeastern Wyoming, eastern Colorado, western Kansas, western Oklahoma, the panhandle of Texas and eastern New Mexico). In addition to the seven million acres already damaged, SCS reports on March 17 showed there were about 18 million acres in condition to blow. Some or all of these 18 million acres may be damaged before the blow season is over if the usual high winds of spring are normal or above normal.

Drouth has persisted over most of this region for four years or longer. Last spring the most widespread and severe soil blowing since 1938 occurred. General conditions did not improve during the last year. In some localities, moisture and crop conditions deteriorated still further. Weather Bureau reports show that a great part of the region received less than half of normal rainfall from July 1954 through February 1955. A December 1 report of SCS showed that more land was in condition to blow—without a protective cover of vegetation—than at any previous time.

Governing boards of soil conservation districts and SCS technicians of the region report that emergency plans for wind erosion control were developed in each district last fall and winter. State and county ASC committees also were active in planning for control measures. Their plans included use of ACP funds allocated to the area for emergency control measures insofar as practical. Spokesmen for the Department of Agriculture said that the secretary had asked for a special emergency fund that might be used to help offset the cost of emergency tillage and the planting of cover crops this spring.

Barriers Reduce Wind Velocity, Evaporation and Control Snow Drifting

The effectiveness of snow fences, solid walls and winter and summer shelterbelts in reducing wind velocities, evaporation rates, home heating costs and controlling snow drifting have been studied by the use of models in a wind tunnel at Manhattan, Kansas. These studies were conducted cooperatively by the Western Soil and Water Management Section, Soil and Water Conservation Research Branch, Agricultural Research Service, U. S. Department of Agriculture and the Kansas Agricultural Experiment Station.

Maximum reductions in wind velocities for single snow fences occur to the leeward of the fence at locations equal to four to 10 times the height of the fence. Summer shelterbelts reduced wind velocities more than defoliated winter belts. Solid walls created eddy currents to the leeward which greatly reduced the effectiveness of this type of barrier.

Shelterbelts can save soil moisture by reducing evaporation rates. Summer belts are approximately 20 per cent more effective than winter belts.

The poorest shelterbelt tested, a 10-row belt, trapped about 135 times as much snow as a solid wall. The best shelter-belt tested, a five-row belt, had a capacity 3.6 times greater than the best snow fence combination, four fences with a spacing between the fences of 12 times the height of the fence.

Though temperatures behind the shelterbelt were little different from those in the open, the reduction in wind velocity alone resulted in substantial savings in fuel consumption. The actual dollar and cent saving on an average home, fully protected from all winds, and heated by natural gas at Topeka, Kansas, rates would be approximately $10 per season.

Complete results of these tests are reported in Kansas Agricultural Experiment Station Technical Bulletin No. 77.

—N. P. WOODRUFF, *Manhattan, Kansas*

Conservation Practices for Sandy Lands

Five years ago research was initiated by the United States Department of Agriculture in cooperation with the University of Nebraska on a 160-acre sandy land farm in northeast Nebraska. This farm, like many other sandy land farms in the area, produced about 20 bushels of corn and 10 bushels of rye per acre. It was being badly whipped about by the wind, blowout spots were numerous.

From the information available on the soil, it appeared evident at first that the soil fertility level should be raised so that larger crop yields could be produced which in turn would afford better protection of the soil from wind erosion. Legumes were grown to supply nitrogen. Lime and

phosphorus were supplied as needed. As a result, corn yields over a four-year period have been increased from 19 bushels per acre on untreated land without legume to 61 bushels following sweetclover on land which received lime and phosphate. Protein content of the corn in 1953 was six per cent on the untreated land and 9.1 per cent following sweetclover on treated soil. Protein produced per acre was 70 and 383 pounds for corn on untreated land and following sweetclover on treated land, respectively.

Hairy vetch has been almost as effective as sweetclover for corn production on sandy land. It can be grown reasonably well on this sandy land without treatment. Vetch grown with rye can be used for pasture, hay or a seed crop. It has become very popular among farmers on much of the sandy land area of Nebraska. Thousands of acres of the rye-vetch mixture are now being produced, whereas the crop was practically unknown in this area five years ago. Using sweetclover or vetch in the cropping system along with proper soil treatments has not only greatly increased grain production, but has also increased the amount of residue that may be left on the surface for protection. By farming the land with the stubble mulch method, soil loss from wind erosion has been almost completely eliminated from this sandy farm.

—F. L. DULEY, *Lincoln, Nebraska*

Cropping Systems Influence Wheat and Corn Yields and Nitrogen Levels of Dryland Soils

Crop rotation studies have been conducted at Mandan, North Dakota, over a 40-year period by the United States Department of Agriculture in cooperation with the North Dakota Agricultural Experiment Station. These rotations contained practices which had varying degrees of influence upon the productivity of the soil. In recent years, crop yields have varied widely, and soil fertility has definitely limited yields in the more exhaustive cropping practices. A comparison of relative yields during a four-year period near the beginning of the 40 years of cropping and during a four-year period near the end of that time is shown in the following table.

Average annual precipitation for the first period was 15.7 inches, as compared to 16.7 inches for the last period. With the exception of the continuous cropping treatments, wheat followed corn and the corn followed small grains in all cropping practices.

Relative yields of wheat for the first period ranged from 86 to 110 per cent, and for the last period from 97 to 149 per cent. Corn yields for the first period ranged from 76 to 111 per cent and for the last period from 68 to 123 per cent. The highest yields were obtained from those rotations containing alfalfa or receiving application of barnyard manure. Wheat yields from these two cropping systems were 40 and 49 per cent greater, and corn yields were 23 and 16 per cent greater, respectively, than for a rotation with grain crops only. Sweetclover growing with the wheat apparently benefitted wheat yields, and to a lesser extent corn yields. Grass in the rotation has not benefitted wheat yields materially, but has improved corn yields. Continuous cropping produced the most corn during the first period, but produced the least by far during the last period.

Relative yields of wheat and corn for two periods of time, and the change of soil nitrogen in the 0- to 6-inch depth of soil under dry-land cropping at Mandan, North Dakota.

Cropping systems	Relative Yields[1] Wheat 1915 to 1918	Wheat 1947 to 1953[2]	Corn 1915 to 1918	Corn 1947 to 1953[2]	Change[3] in soil nitrogen
	%	%	%	%	%
Grain crops only	100	100	100	100	–34
Grain crops plus grass	86	97	76	110	–30
Grain crops and sweet clover[4]	105	124	94	110	–30
Grain crops and alfalfa	110	140	97	123	–19
Grain crops plus manure	101	149	94	116	– 3
None (continuous wheat)	96	113	—	—	–18
None (continuous corn)	—	—	111	68	–42

NOTE: Wheat followed corn and corn followed wheat in all rotations.
[1]Rotation of grain crops only used as base.
[2]Four-year average. Three years omitted because of hail damage.
[3]Based on nitrogen content of virgin sod. Soil analyzed in 1953 after 40 years of cropping.
[4]Sweetclover was grown with wheat, and plowed under for green manure the second year.

With a few exceptions, there is a fair relationship between the yields during the last period, and the loss of soil nitrogen during the 40 years of cropping. Those cropping practices which produced the highest yields during the last period lost the least nitrogen. Conversely, those cropping practices which produced the lowest yields lost the most nitrogen. It is apparent from these results that soil fertility is limiting crop production on dryland soils of this area where cropping systems have not included legumes or where manure applications have not been made. Thus, it is important to consider soil fertility maintenance as well as moisture conservation in a sound conservation program for these dryland soils.

—HOWARD J. HASS, *Mandan, North Dakota*

Conservation Film

Green Gold. *16 mm., sound and color. 29 minutes running time. Produced by Republic Steel Corporation, Cleveland, Ohio.*

Republic Steel has produced *Green Gold* to help promote a better balanced farm program. This color film brings to the American farmer in an interesting, understandable way the story of the profits to be found in growing good grass as a crop.

Green Gold revolves around young Dan Weston, who enters a speaking contest for a scholarship to convince his dad they should adopt grass as a permanent crop. Dan turns to Dr. Myers at the university for facts. Dr. Myers explains good grass farming to Dan with a graphic story that will repay all who see *Green Gold*. From start to finish, *Green Gold* tells a heart-warming story that will bring both pleasure and profit to farm folks of all ages.

Resource Items Briefly Noted . . .

Professor Howard E. Conklin, land economist, Cornell University, Ithaca, New York, has a brief five-page article *"The Cornell System of Economic Land Classification"* in the January 1955 issue of Cornell's *Farm Economics*. The author points out that the Cornell system of economic land classification was developed in Tompkins County, New York, in the early thirties. Land class maps have now been published for 19 counties. These maps are published in color, with the text condensed so that the final publication is but one sheet of paper folded into a leaflet.

Professor Conklin says, *"The economic land class maps prepared at Cornell present a classification of farm business units in terms of expected relative income levels for most probable buyers. Soil and other aspects of land such as topography, elevation and location are considered in making the income appraisals, but are reflected in the final classification only as they affect the incomes of farm businesses."* It is pointed out that land does set a ceiling on success and that there is a tendency to over-price and over-tax the less productive lands and to under-price and under-tax the most productive. The economic classification represents an income appraisal. The author further points out that economic land class maps are useful to prospective farm purchasers, for bankers and lenders in guiding and adjusting amounts and terms of loans for successful repayment, for extension workers, agricultural teachers and others working with farmers and farming programs, and they may be used as general guides for tax assessment policies, and for policies regarding road and other public improvements and facilities.

Soil Conservation in Michigan

C. R. Hoglund, Agricultural Research Service, United States Department of Agriculture and the Michigan Agricultural Experiment Station, is author of a Michigan State College Agricultural Experiment Station special bulletin 394 (January 1955) *"Soil Conservation in Michigan—Progress and Problems."* This bulletin reports a study the purpose of which was to explore the progress and problems of Michigan farmers in adopting soil and water conservation practices from the standpoint of indicating additional methods that could be used in attaining greater application of improved practices. A total of 157 soil conservation district planned farms and 119 non-planned farms in five counties were studied.

Some of the highlights of this Michigan study as presented in the summary by the author are:

The study showed that 70 to 80 per cent of the cooperators in each of the five soil conservation districts believed their farm plans were workable. The other 20 to 30 per cent had decided that the changes in farm organization and practices provided for in their initial farm plans were too drastic or did not provide sufficient flexibility. From 10 to 30 per cent of the cooperators in each of the five districts had adopted essentially all of the component parts of the farm plans. An additional 50 per cent or more had made substantial progress in applying one or more parts of the plans. This progress was made during a five- to seven-year period preceding 1952.

Cooperators in each of the districts, except those on cash-crop farms, attained about 60 per cent of the planned acreage of sod crops—the basic part of every farm plan.

District cooperators tested their soil for lime to a greater extent than non-cooperators. There was no significant difference between cooperators and non-cooperators in the percentage that tested their soil for fertilizer and applied fertilizer to their crops.

District cooperators were much more optimistic than non-cooperators as to the effects of conservation practices on future crop yields.

A majority of both district cooperators and non-cooperators believed they were controlling erosion with the practices they were using.

In appraising the usefulness of district programs, two-thirds of the district cooperators rated technical aid as the most helpful assistance they received. Information on soils and adapted cropping programs was rated next in order as a useful aid in establishing conservation practices.

District cooperators suggested additional aids which they thought would speed up adoption of conservation practices. *They expressed a need for: (1) Stepping up educational programs designed to inform more farmers about the problems of soil conservation and improvement on their own farms. (2) More research is needed on safe alternative uses of land in various capability classes as a basis for development of alternative systems of conservation farming. (3) Enough technical assistance is needed to help in revising some of the conservation plans made several years ago.*

The study further confirmed the influence of several other problems in the use of soil conservation practices. Among these are the age and tenure of the operator, inadequate capital and credit with which to finance adjustments in system of farming, reduction in income during the period of adjustment, and the additional risks associated with additional livestock to use more forage.

SOME NEW INDUSTRY PRODUCTS

New Model Case Combine

Specialized construction adapts the new Model "75" Case Combine for a wide variety of grain and seed crops with equal efficiency.

It takes a 7-foot swath, just right for soybeans, sorghums, and other crops grown in similar rows. The new cutter bar has strong, slender steel guards that go through rank, tangled growth without clogging, and they provide 30 per cent more cutting area.

"Air-lift" cleaning features a positive-flow fan of variable speed design, performing equally efficient at any selected speed. All combinable crops from heavy beans to light, fluffy seeds can be harvested without waste. This is achieved by maintaining uniform, constant air pressure at every point through the cleaning sieves.

Unexpected shock loads are readily absorbed by the new flat-belt main drive feature found on both PTO and engine driven models. The Case "75" also includes a dual position swing-over drawbar for either road travel or field work. Position is changed by moving one pin-bolt. Customers have a choice of rub-bar or spike-tooth cylinder.

Truck for Ammonia Tanks

Specially designed for hauling one thousand gallon ammonia tanks, the Case Special Farm Truck trails true for highway travel. Automotive-type steering linkage provides the "true-trailing" feature.

Due to flexible frame and telescoping swivel hitch design, the Case Farm Truck will move easily over rough fields. When fertilizing with ammonia, it is not necessary to drive the applicators out of the field for refills. The supply tank is easily brought to the applicator equipment.

Filling the increasing need for ammonia handling equipment, the Model VWTA-66A Farm Truck is of high clearance and wide tread construction. Besides unusual ease of travel over rough fields, it can also be safely trailed at normal highway truck speed. Roller-type wheel bearings are sealed against dirt and weather conditions. Front spindles

and steering linkage are equipped for pressure lubrication. The Case Special Farm Truck for ammonia tanks has special flat leaf type spring bolsters. For maximum highway safety electrically operated wheel brakes can easily be added.

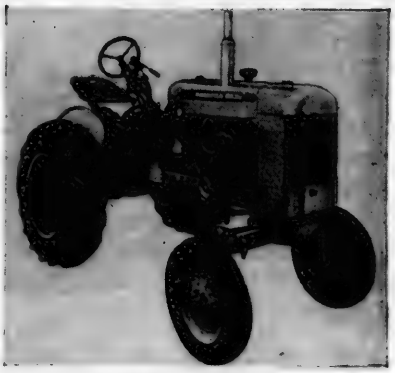
For extra strength, axles have been made of I-Beam construction. Frame design is of the all wheel type to assure strong, shock-resistant features.

New One-row Tractor

A new one-row tractor with two-plow power is now coming off the assembly lines at the Minneapolis-Moline Company plant in Louisville, Ky. It will be called the model BG.

Company engineers claim that the new BG tractor has been designed for farmers who specialize in one-row crops and also as a second tractor on large farms.

Although the BG will be a one-row tractor, it will be basically a two-



plow model. A new type of front-end style has been designed that can be adjusted from 40 to 58 inches to handle all row spacings of one-row crops.

Company engineers have designed a special front mounting bar for mounting cultivating planting, and fertilizing attachments.

The new BG tractor will also be available with a three-point hitch similar in design to the company's three-point hitch, the Hitchor, announced recently.

The design of the BG tractor will be unique in that the tractor engine will offset to the left of the tractor centerline and the seat offset to the right of the centerline to provide the operator with an unobstructed view of the farm work being done.

According to company officials, this new tractor will meet the demands of farmers for a one-row tractor with enough power to handle other farm jobs.

New "Economy Line" Coupler

The Portable Aluminum Irrigation Company of Vista, California, announces introduction of a new, patented *"Economy Line"* coupler.

Developed primarily for use in low-cost irrigation systems, it will also provide existing systems with an inexpensive coupler for semi-permanent installations, main lines running to the edges of fields, or for gated pipe where low pressure is used.

The coupler is cast in two sections from lightweight aluminum, and will carry a

(*Continued on page* 160)

News Notes

Governor Kohler Co-Chairman of Local Arrangements for Annual National Meeting

Shown reading the January JOURNAL OF SOIL AND WATER CONSERVATION with I. O. Hembre, chairman of the Wisconsin Chapter, Governor Walter Kohler of that state has accepted the co-chairmanship of the Wisconsin arrangements for the 10th Annual Meeting of the Soil Conservation Society of America.

Governor Kohler was presented with an honorary membership in the Wisconsin Chapter at their meeting in Milwaukee on January 21, 1955. In addressing those present, he stated, "Conservation of our natural resources is of tremendous importance to the welfare of our state. I am pleased to know we are doing something about it in our nation and state before it is too late. In my travels I have seen many countries which are facing dire situations because they acted too late. Soil conservation is basic to all conservation. I commend you on the leadership provided this important work and am honored to be a member of your society."

Mr. Hembre has been appointed chairman of arrangements for the annual meeting and he in turn has a staff of Wisconsin Chapter members busy with arrangements for your attendance at the meeting to be held at Green Lake, Wisconsin, on the grounds of the American Baptist Assembly, September 12-14, 1955.

Are Your Dues Paid for '55?

Third notices for 1955 membership dues were mailed to over 2,000 delinquents on April 8.

Please tell your friends that if they failed to receive their JOURNAL they might check their membership card.

Address correct? The national office has a large task in keeping address, records of dues, etc. If for any reason your address or billing is incorrect, just notify us and we'll gladly check our records.

Sustaining Members

Last year the membership voted to establish sustaining memberships in the Society. These memberships are for a calendar year and for those individuals or firms desiring to support the Society in a more substantial manner. To date the following individuals are listed as sustaining members for 1955:

R. Y. Bailey, P.O. Box 311, Auburn, Alabama.

John E. McCuen, 48 Montrose Street, East Greenwich, Rhode Island.

Donald A. Williams, 5135 N. 15th Street, Arlington, Virginia.

Roy D. Hockensmith, 2832 McKinley Place N.W., Washington, D. C.

Robert N. Downs III, Glenden Farms, Old Baltimore Road, Wilmington, Delaware.

Maurice H. Lockwood, 745 Sheridan Road, Winnetka, Illinois.

Austin L. Patrick, 4228 S. Columbia Pike, Arlington, Virginia.

The Wm. C. Popper Company of which Julien J. Proskauer is president, 148 Lafayette Street, New York, New York, is the first institutional sustaining member.

Individuals may become sustaining members by sending $25 or more for their dues. Business firms, organizations and institutions may become sustaining members for $100 or more.

Membership Gains

Nearly 400 new members joined the Soil Conservation Society of America during the first three months of 1955. North Dakota and Iowa continue to lead all states in recent gains although several states have active membership campaigns under way at the present time. The record for January, February and March is as follows:

North Dakota	45	Mississippi	3
Iowa	23	Idaho	2
North Carolina	18	Oregon	2
Wisconsin	14	Arizona	1
Alabama	11	Colorado	1
Missouri	11	Maine	1
Michigan	10	Massachusetts	1
Nebraska	10	New Hampshire	1
California	9	Ohio	1
District of Columbia	9	Utah	1
New York	9	Puerto Rico	2
Pennsylvania	9	Virgin Islands	2
Florida	8	*Canada*	
Texas	8	Ontario	8
Arkansas	6	Alberta	1
Indiana	6	*Foreign*	
Kentucky	6	Yugoslavia	2
Maryland	6	Peru	2
Montana	6	Czechoslovakia	1
Oklahoma	6	Thailand	1
South Carolina	6	Turkey	1
Washington	6	Holland	1
Illinois	5	Panama	1
West Virginia	5	Brazil	1
South Dakota	5	Austria	1
Virginia	5	Chile	1
Connecticut	4	India	1
Kansas	4	*Students*	
Minnesota	4	Texas	57
New Jersey	4	Michigan	12
Tennessee	4		
Georgia	3	Total	394

10th Annual Meeting
Green Lake, Wisconsin
September 12-14, 1955

"The Story of Land," New Booklet Published By SCSA

A new booklet, entitled "Through the Centuries! The Story of Land—Its Use and Misuse," has just been introduced by the Soil Conservation Society of America. Under development by a committee chairmanned by Harper Simms, Office of Information, Soil Conservation Service, Washington, D. C., for several months, the booklet is now ready for distribution.

All soil conservation districts, all members and many of the supporters of the Society will receive complimentary copies. The booklet is of the illustrated type, on newsprint, is easily read, and extremely usable for non-technical meetings, displays, advertising, schools, etc. It is the story of what soil is and what it means to us—how it was cared for in ancient times, how it is being cared for now.

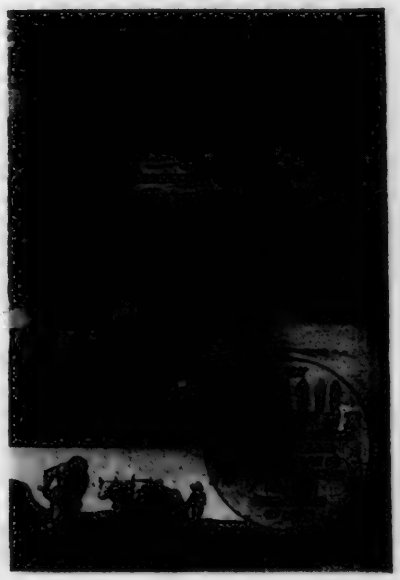
Printed and produced for the Society by the Wm. C. Popper Company of New York, the book will be shipped to purchasers from Cleveland, Ohio, or the national office. The Society will sell the publication and it is anticipated that many soil conservation districts, business firms and industries who used "Down the River" will find this booklet equally as valuable.

Sale price, delivered, is as follows:

1—	9	booklets	$ .20 each
10—	99	booklets	.10 each
100—	199	booklets	.075 each
200—	499	booklets	.06 each
500—	999	booklets	.05 each
1,000—	9,999	booklets	.045 each
10,000—	49,999	booklets	.04 each
50,000—		booklets	.03 each

This means that purchasers will receive 100 booklets for $7.50, 500 for $25, 1,000 for $45, 10,000 for $400. The back page of the booklet may be imprinted for an addi-

(*Continued on page* 156)



President's Column

The council of the Society met on April 22 and 23 in Washington, D. C. A considerable portion of the time was spent discussing the coming annual meeting which is to be held at Green Lake, Wisconsin, on September 12, 13 and 14. Russell Hill and I. O. Hembre were both with the council while the annual meeting matters were discussed. The former is chairman of the annual meeting program committee and the latter is chairman of the local arrangements committee.

Am pleased to report that both committees have been very active and that both the meeting agenda and the meeting arrangements have been developed to the stage where one is able to get an idea of what is in store for those who attend. Your council is pleased with the outlook for the meeting. They believe that this experimental type of annual meeting will please the membership and their families.

The term "experimental type of annual meeting" is used because we look upon the coming Green Lake affair as a trial type of conference. It differs from any of the annual meetings of our Society in many ways. Heretofore, all of the meetings have been held in large hotels located in cities and they have always been held in the late fall or early winter months. The Green Lake conference is being held out in the country on a large estate bordering a beautiful lake. It is a recreational type of a set-up. The place boasts of many kinds of accommodations, all on the American plan, that vary from relatively inexpensive dormitory sleeping quarters to cabins of various sizes and more costly Inn accommodations that compare favorably with those found in the best hotels.

A Society committee recommended that once every so often we hold a meeting at a spot like Green Lake. The hope is that in addition to those who usually attend the meetings that members who do not feel they can afford to attend many meetings will be with us at Green Lake. Perhaps many will come with their families for the whole family will have a wonderful time there.

A word about the agenda for the meeting. Since the outlook is good for the attendance of many field men, the program committee is arranging an agenda that will be of interest to them, as well as those of us who tramp the fields a little more slowly. Another agenda feature will be a discussion of what some very active chapters are doing. Our very much alive

(*Continued on page* 157)

CONSERVATION AWARD of MERIT
This Certifies that
MRS. SADIE M. LISKUM
has given outstanding leadership in
4-H CONSERVATION PROJECTS
and in Recognition is presented this Certificate
by
Michigan Chapter Soil Conservation Society of America
in cooperation with
Cooperative Extension Service, Michigan State College
JANUARY 1, 1955

Michigan Chapter Sponsors 4-H Conservation Project Leader Award Program, Results Announced

Recognition for a job well done is easy to give. It is rarely solicited, but very often warranted. In looking around for an activity to promote, the awards committee of the Michigan Chapter, Soil Conservation Society of America, hit on the idea of giving recognition to outstanding adult local leaders of 4-H Conservation Clubs.

The idea grew. With the help of an anonymous donor, $300 annually was made available. The State 4-H Club office assisted in preparing a brochure announcing the activity, local extension folks nominated the outstanding 4-H Club leader in their areas. Eight district winners were then selected.

As a result, these eight local 4-H Conservation Club leaders will receive an expense paid trip to the 4-H Conservation Camp at Chatham in Michigan's Upper Peninsula. They will, along with 13 county award winners, receive a "Conservation Award of Merit" pictured in this article. The "Conservation Awards of Merit" are presented locally at 4-H leader recognition banquets or at Soil Conservation District Annual Meetings by a local member of the Michigan Chapter. (A lot of members get in the act.)

The eight district winners this year have served a total of 51 years as leaders of 4-H Conservation Clubs. One of the winners, Mrs. Sadie M. Liskum, No. 3, East Jordan, has been a school teacher and 4-H Club leader for 18 years. Ed Rebman, Charlevoix County agent, says, "Mrs. Liskum has been one of the backers of our 4-H Conservation Clubs for the past nine years. She has been a member of the education committee of the Charlevoix Soil Conservation District—she handles her 4-H program on conservation in the fifth grade room. Through English, Social Science, Reading and General Science she makes practical and constant use of conservation knowledge."

The Michigan Chapter brochure announcing the recognition program says, "This program is founded on the belief that the 4-H Conservation leaders are performing a service of outstanding value in conservation."

A complete list of the winners is as follows:

DISTRICT WINNERS
4-H Conservation Leaders Recognition Program

Name	*County*
Harold Marshall	Gogebic
Mrs. Sadie M. Liskum	Charlevoix
Marion Richardson	Missaukee
Elmer J. Lomerson	Lapeer
Dorothy Willis	Livingston
Mrs. Hazel Beattie	Ionia
Helen Fosdick	Cass
Mrs. Josephine Buischel	Ottawa

COUNTY CERTIFICATE WINNERS

Mae M. Christie	Sault Ste. Marie
Everett Dahlvik	Escanaba
Fern Baker	Thompsonville
Keith Middleton	Lake Orion
Mrs. Joan Sanghas	Mount Clemens
Madalene R. Pohnert	Whitmore Lake
Mrs. Izola L. Kimmey	Delton
Frank Crandall	Battle Creek
Elmer Lindeman	Benton Harbor
Mrs. Frank Herlihy	Comstock
Mrs. Laura Wood	Bitely
Katherine Newhouse	Muskegon
Frank Haynor	Shelby

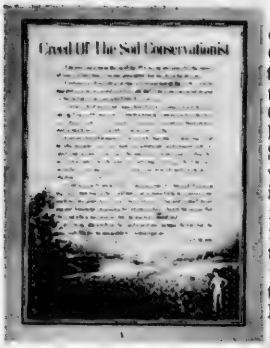
Story of Land

(*Continued from page* 155)

tional charge. For information regarding back page imprinting, direct inquiries to the national office. All orders should be directed to 1016 Paramount Building, Des Moines 9, Iowa.

The Society will continue to print and distribute "Down the River."

Soil Conservation Creed Available



The Creed of the Soil Conservationist, written by C. W. Gee, formerly with the Soil Conservation Service and more recently a member of the Bert Gittins Advertising Agency, Milwaukee, is available from the National Agricultural Supply Company, Fort Atkinson, Wisconsin.

The Creed is the property of the Wisconsin Chapter of the Society. It is well adapted as a low cost award for soil conservation districts, vocational agriculture students, farmers and others. Every soil conservationist should have a copy on the wall of his office.

Hugh Highsmith, president of National Agricultural Supply Co., Fort Atkinson, Wisconsin, is treasurer of the Wisconsin Chapter and states that copies may be secured direct from him for $1 each.

Dr. Lowdermilk in Israel

With a recent note to change his address the following letter of interest to many Society members was received from Dr. W. C. Lowdermilk:

Haifa Technion
Haifa, Israel
February 10, 1955

Dear Mr. Pritchard:

This is to tell you that I have taken up here at Haifa Technion (An Institute of Technology) an assignment under the sponsorship of the U. S. Department of State, in the International Educational Exchange Service, for Agricultural Engineering and Soil and Water Conservation.

I finished the assignment as consultant to the Bureau of Economic Affairs and Development of the United Nations, with a final report containing proposals for the setting up of a water unit at United Nations Headquarters to give Headquarters leadership in promotion and coordination of activities having to do with water in the United Nations, its specialized agencies and associated non-governmental international organizations as called for by Resolution 417 (XIV) of Economic and Social Council of United Nations. This report was submitted February 4 and on February 5 my wife and I flew to Israel, arriving February 7, 1955.

We have a house with a broad balcony on Mount Carmel, standing on the brink of the Carmel that overlooks the Haifa Bay to the north and Mt. Hermon, now snow capped, to the northeast. It is a wonderful sight. So we are at home to soil conservationists and our friends at 25 Panorama Road, Mt. Carmel, Haifa, Israel.

The United Nations and the United States Point Four (U.S.O.M.) have an interesting group of international specialists busy at work rendering technical assistance to this new state full of energetic people eager to learn all there is to know in redeeming the good earth and in creating a vigorous society—and nation in these old and storied lands of the Bible. Come to see us within the next year and a half.

W. C. Lowdermilk

President's Column

(*Continued from page* 156)

chapter activities committee will have charge of this part of the meeting. Chapter work and its importance was mentioned in this column in both the January and March issues. It cannot be stressed too much since it is the main direct contact most members have with the Society outside of the Journal. Live, wide awake, up and coming chapters are forwarding the "Science and Art of Good Land Use." They hold the membership and attract new members.

Regardless of whether your chapter is a very active one or one that is less active, you will get some good ideas from this year's program.

In the near future each of you will receive some information about the meeting, as well as about the wonders of Green Lake as a meeting place. September will be here before you realize it so make your plans to join your fellow conservationists there.

—AUSTIN L. PATRICK, *President*

FACILITIES AVAILABLE FOR ANNUAL MEETING SEPTEMBER 12-14, 1955

The low daily rates include lodging, medical insurance, meal cost of $3.25 and full use of "over 1000 acres" of assembly grounds, buildings and recreational facilities."

	Dormitory	3 or 4 Per Room	2 Per Room	1 Per Room
ROOMS WITH CENTRAL BATH AND TOILET				
Cottages: Moore and Parsons			5.00	
Tepee and Indian Village Dormitory	5.00	....	....	....
John Clarke Lodge		5.25	5.75	7.00
Brayton Case, Morehouse and Indian Village			5.75	7.00
ROOMS WITH SEMI-PRIVATE BATH AND TOILET				
Houses: Burton, Dawson, Kinbrook, Log, Saunders, Sunshine, 497, 542, 550, and 556			5.75	7.00
Houses: Delmar and Montgomery and (close to Inn) Lakeside, Lawson & Robbins		7.75	8.25	10.25
ROOMS WITH PRIVATE BATH AND TOILET				
Covenant House (Motel Type)			6.00	7.50
Roger Williams Inn		8.25	8.75	11.25

Price at left includes cost of room and meals.
Example: Cost per person in twin-bed room in lovely Roger Williams Inn is $3.25 for meals, $5.50 for room, only $8.75 total.

CHILDREN'S RATES: Ages 3 thru 11 years, in room with parents, ½ the "2 Per Room" rate. Under 3 yrs. $1.75 per day.

A limited number of housekeeping cabins (for 4, 6, 8 persons) at $4.50 to $9.50 per cabin per day with private or central bath and toilet, blankets and kitchen equipment, but not meals. (Meals may be taken at the Inn at cost up to $3.25 a day.)

*Golf, motor boat rides and conference fee is extra. The grounds, buildings and improvements have been provided by gifts from many people. Daily rates are held at a minimum to cover bare costs of operation and maintenance. The American Baptist Assembly, Green Lake, Wisconsin, is a non-profit organization.

Fee Attached

REGISTRATION CARD

$_____ (Advance Deposit $2.50 Per Person)

10th ANNUAL MEETING
SOIL CONSERVATION SOCIETY OF AMERICA

NAME_____ (Give age, if child) _____)
(Last name first) (Please indicate: Miss, Mrs., Mr., Dr., Rev.)

STREET AND NUMBER _____

CITY AND STATE _____ Church _____

(Please check whether address is Home....., Business.....)

DATE OF ARRIVAL___BB___AM___PM___EVE___ (BB, before breakfast; AM, before noon meal; PM, before eve. meal; Eve, after eve. meal)

DATE OF DEPARTURE BB___AM___PM___EVE___

TRANSPORTATION

ARRIVING BY: Auto ☐ Bus ☐ Train ☐ Plane ☐

PLEASE MEET ME AT _____

Date _____ Time _____ A.M. ☐ P.M. ☐

(Please do not write in this space)

LIST HOUSING PREFERENCE

I plan to room with the following persons:

1. _____ _____
2. _____ _____
3. _____ _____

AMERICAN BAPTIST ASSEMBLY, Green Lake, Wisconsin

Chapter Activities Show Interest In Society

San Francisco Bay Chapter

A regular meeting of the San Francisco Bay Chapter was held in the Forestry Building on the University of California campus at Berkeley on February 7. The program was under the direction of E. A. Colman and consisted of a panel discussion on the subject: "Educational Requirements for Professionals in Soil and Water Conservation." Panel members included Geoffrey Bodman, Soils Department, University of California; Clare Hendee, U. S. Forest Service; Stanley Cosby of the Soil Conservation Service.

The panel covered every phase of training and it proved most informative for those in attendance. It will be followed next month with a discussion of "Educational Programs Offered for Soil Conservation Training."

The meeting was preceded by an enlarged attendance at the chapter council session where the Society's national program was outlined by Secretary Pritchard. Considerable discussion was held regarding the possibility of holding a national meeting of the Society on the West Coast in 1957 or 1958.

Manhattan Chapter

Forty-five persons attended the quarterly meeting of the Manhattan Chapter, Soil Conservation Society of America, at the Sunflower Hotel in Abilene on the evening of March 11. Following the dinner, and the introduction of those present, the minutes of the previous meeting were read. Chairman Atkins pointed out that the goal for new members in Kansas during 1955 is 100, of which 14 have already been obtained. The chairman appointed a committee to consider the feasibility of encouraging the sale of the publication, "Down the River." That committee is as follows: Paul Jameson, chairman; B. K. Geraghty, Chester Wells, J. W. Yantiss and Raymond Neher.

Speakers of the evening were Mr. and Mrs. Harold Scanlan of Abilene. Mr. Scanlan, who is farm manager of the St. Joseph Orphanage at Abilene and a member of the Dickenson County Soil Conservation District Board of Supervisors, presented a talk which he had previously given at the national meeting of the Board of Supervisors at San Diego, California, in February. He also gave a report on the meeting. Mrs. Scanlan presented a vivid picture, illustrated with colorful slides, of the trip to California. The next meeting is scheduled for June 17.

O. W. Bidwell, Secretary

Little Egyptian Chapter

In one of the most comprehensive projects carried on by any chapter, a week long series of pasture seeding demonstrations was conducted by the chapter from September 20 through 24. The chapter sponsored the pasture demonstrations with Mr. James Pryor, Agricultural Agent of the Illinois Central Railroad. They were conducted in Jackson, Perry, Williamson, Johnson, Union, Pulaski, and Pope County Illinois, in the heart of the drouth area.

The demonstrations started on the Southern Illinois University farm on the 20th. A pasture seeder made by International Harvester Company was used which placed the starter fertilizer in the bottom of a small furrow and the larger grass seeds about one-half to three-fourths of an inch from the surface and the small seeds on the top of the furrow. The object of the demonstration was to reseed the pasture and legumes without plowing or disturbing the original sod.

On September 21 demonstrations were held near Pickneyville, and near Carbondale.

The next day the demonstration was in Williamson County and Johnson County.

The last two days saw three more demonstrations. All were attended by farmers and Society members.

According to George Walker, Chapter Chairman, the project was very successful and a practical one as there are thousands of acres in Southern Illinois needing treatment due to drouth conditions. Over 150 farmers attended the demonstrations and several news articles appeared, however, the chapter would recommend that plenty of advance publicity be given such a project.

University of Michigan Chapter

The University of Michigan Chapter of the Soil Conservation Society of America was officially approved by the university as a campus group and held weekly meetings from September, 1954, to date.

The early meetings of the semester were devoted to organizational matters: election of officers, selection of programs, etc. The following officers were elected to serve during the academic year, 1954-55: Michael F. Brewer, president; Hugh C. Davis, secretary, and William L. Howenstine, treasurer.

The chapter forwarded and passed a motion to establish two standing committees for the following purposes:

1. To initiate and maintain an open file covering employment opportunities in the general area of conservation. It was decided to accomplish this by soliciting information from correspondence files of individual students and through letters of inquiry to be sent to selected federal and state agencies as well as to private businesses.

2. To initiate and maintain an open file covering study and research facilities available to students in the area of conservation. This includes scholarships, research grants, fellowships, etc.

The University of Michigan Chapter devoted seven of its weekly meetings to the following, specific programs:

1. Prof. Stanley A. Cain—An ecological approach to the study of historical vegetation and landscapes.

2. Mr. Michael F. Brewer—The demands of the population of Israel upon the country's indigenous resources.

3. Miss Judy Franklin—An illustrated talk on recent anthropological work in Santa Fe and San Miguel Counties, New Mexico.

4. Mr. Charles Gebler—An illustrated talk on national parks and monuments.

5. Mr. Hugh C. Davis—Food and population problems of Ceylon.

6. Mr. Al Butcher (Commonwealth Fellow to the U. of M. from Australia)—A contrast of fish and wildlife management philosophy in America and Australia.

7. A field trip with Mr. Donald Maurer of the local Soil Conservation District to an "S.C.S. planned" farm.

Every three weeks the chapter has been presented a summary of recent federal and state legislation of conservation interest. These reports were made by Mr. Charles Gebler.

On December 7, 1954, the chapter held an open house for students and faculty of the School of Natural Resources here at the university. At that time Mr. Dale Ball, president of the State Chapter of the S.C.S.A., presented the University Chapter with its national charter. The following guests also attended the ceremony:

Charles Shick, Extension Specialist in Game Management, Michigan State College.

William F. Jewell, Extension Specialist in Land Use Planning, M.S.C.

Lewis E. Arnold, Graduate Assistant, M.S.C.

Frank W. Suggitt, Land and Water Conservation Dept., M.S.C.

Elmer A. Taylor, Past Chairman of the Michigan Chapter, S.C.S.A.

The chapter faculty advisors have been of great assistance in the formulation of our program and committee activities.

Hugh C. Davis, Secretary

Southern New England Chapter

Several weeks ago the officers and program committee issued a request for individuals to present papers at their meeting of February 23 and the response was so great not all papers could be placed on the program.

Mr. Ward Duffy gave the keynote talk. Other papers presented included: "Soil Monoliths and Soil Profile Color Slides," by Fred Filios, Soil Conservation Service; "Popular Misconceptions About Conservation," Henry Renouf, soil district supervisor; "Soil Structure and Its Effect on the Conservation and Management of Soils," C. L. W. Swanson, Connecticut Experiment Station.

Others presenting papers were: Benjamin Isgur, Soil Conservation Service, "The Conceptual Scheme of Soil Conservation." Lester Gove showed slides of a recent visit to Hawaii. Gregory Curtic, Connecticut county agent, "A Critical Look at Farm Planning." Charles Turner and Meyer Helfgott furnished entertainment.

In addition to the program, a business session was held and the chapter voted to invite the national organization to meet in Boston for the 1956 meeting.

Officers elected for 1955 included: W. Thedore Heble, chairman; Charles Turner, vice-chairman; Meyer D. Helfgott, secretary; Robert S. Bell, treasurer; John McInerney, council; John McCuen, council; Carl O. Clark, council, and N. Paul Tedrow, council.

TED HEBEL, *Secretary*

Lincoln Chapter

Seventy-nine members and guests were present at the chapter meeting on March 14, 1955, to hear Dr. Charles Kellogg of the Soil Conservation Service in Washington discuss "Soil Conservation in the Humid Tropics."

Dr. Kellogg presented his talk with colorful slides, limiting his discussion to the lateritic soils group. He explained how the tropical canopy of vegetation influences soil development and called attention to the potential agricultural future of the tropics. He explained how bacteria and insects work in harmony with the forest in developing soil structure and texture and how the process of alluviation influences fertility.

Inland Empire

The chapter met at the Washington Hotel in Pullman on March 1, 1955. Walter Gardner, vice chairman, called the meeting to order and the usual business was transacted. Paul McGrew discussed the 10th annual meeting to be held at Green Lake, Wisconsin, and urged attendance.

P. Kent suggested a recognition program for the best conservation job by an individual member during the year. A committee was appointed to work out details. R. Bertramson discussed the objectives of the Society and the progress the organization had made. He suggested the next meeting be held in conjunction with Washington State Experiment Station Grass and Forage Crop Field Day, June 9, 1955.

Balance of the meeting was spent in viewing the movie "Enough and For All," a production by the Massey-Harris Company.

Washington Chapter

Chapter 1 (Washington, D. C.) brings a diversity of interests to the Society with its 1955 officers. Thomas L. Ayres, Chairman, works with the Agricultural Conservation Program Service, U. S. Department of Agriculture; George Heddon, Vice Chairman, is an employee of the Bureau of Indian Affairs, Department of Interior, and D. Harper Simms, Secretary-Treasurer, is with the Soil Conservation Service, also U. S. Department of Agriculture.

The chapter is embarking on an enlarged field of activity projects under the chairmanship of W. J. Endersbee, who was the 1954 chapter chairman.

Hugh Brown and his membership committee got off to a good start with six new members for the first meeting of the year.

To allow the new officers and committees a chance to get well organized after their election and appointment, the chapter has made it a practice to have the previous program committee carry over for one additional meeting after the elections. Therefore, Ernest Gambell as retiring chairman of the program committee was in charge of the January meeting. Clay Stackhouse will chairman the committee in charge of subsequent programs.

At the January meeting, Carl Brown, a member of the Chapter, gave a lecture and showed slides on "Agricultural Project Development in Japan." The lecture gave the results of a trip to Japan in 1954 as a member of a committee from the World Bank. The agricultural attache from the Japanese Embassy, Seimei Nakajima, was a special guest.

Hope for the rejuvenation of long misused lands bordering the Mediterranean was expressed by Dr. Edward H. Graham when he addressed members of Chapter I and guests on March 8.

Dr. Graham received the John Simon Guggenheim Memorial Fellowship for 1954 to make a six-month comparative study of land resources in the Mediterranean area. His discussion, illustrated by colored slides, was well received by the large audience filling the Jefferson Auditorium in the South Agriculture Building.

Dr. Graham is first vice president of the National Soil Conservation Society of America and a member of Chapter I.

"I suppose," Dr. Graham said, "if there was one strong impression I got from the trip it was this:

"That in spite of the long history of extensive pressure upon the land in the Mediterranean region, with its centuries of timber destruction, over-grazing and man-induced erosion, the land retains real power of response to management; that in spite of varying social and economic influences, conditioned always by political settings, here is a fertile place for improvement; and, because the land is responsive, hard work and human ingenuity may here perform miracles in converting an antique land into a more pleasant and productive environment."

Custer

The chapter meeting was held at the Great Plains Field Station at Bismarck, with a tour of the soils laboratory conducted by Howard Haas prior to the formal session.

During the business session it was proposed that a traveling trophy be established for competition among the four chapters in North Dakota. A report of the national convention was given by Adrian Fox.

It was determined that three meetings would be held during the year, that a recognition program be established and that the booklet "Down the River" be promoted as a chapter project.

Officers elected for 1955 were: Keith Schreiner, chairman; Howard Haas, vice-chairman; Clifford Wahl, secretary, and Carl Kuehn, council.

North Carolina Chapter

The executive council of the North Carolina Chapter met at North Carolina State College on February 28 where they developed plans for future activities of the chapter. Consideration was given to nomination of Fellows and Honorary Members in the national organization, a recognition program for the chapter, of changing the constitution and by-laws to allow two vice-chairmen. A membership committee report was given and an educational committee was appointed to work with soil conservation district supervisors.

On March 21 Mr. S. Vernon Stevens, retiring state president of the North Carolina Association of Soil Conservation District Supervisors, sent a letter to all soil conservation district officials encouraging them to join the Society.

South Dakota Chapter

The South Dakota Chapter held its annual meeting in Rapid City on February 10 and 11 in conjunction with a sectional meeting of the American Society of Range Management. The two day meeting included papers:

"Conservation of Diverted Acres" by John A. Johnson; "The Angostura Irrigation Project," George A. Schmid; "Hold That Water With Terraces," M. K. Craig; "Stream Gauging," Leonard B. Yarger.

At the evening banquet where awards were presented, Dr. Ben Reifel of the Pine Ridge Indian Reservation talked on "We and the Soil."

A business session was held on the second day with James Hughes elected as chairman and Ray Huxtable as secretary. Other papers presented were: "Principles of Grassland Management," James K. Lewis; "More Beef from Grass Through Breeding," H. P. Holzman; "Assets of South Dakota," E. Hixon; "Grass Hay at its Best," Tom Strachan; "Use and Management Opportunities on the Black Hills National Forest," J. A. Kern; "Weather Modification," A. M. Eberle.

Wisconsin Chapter

The quarterly meeting of the Wisconsin chapter, held at River Falls State College, River Falls, was attended by 178 people. The group assembled for coffee at 2:30 p.m. on April 1, 1955. The meeting was called to order by Chairman Hembre at 3:00 p.m. Chairmen of the two sessions were H. G. Seyforth and E. E. Anderson, County Agents of Pierce and St. Croix counties. Melvin Wall of River Falls, served to make local arrangements.

Professor Walter Rowlands of the University of Wisconsin discussed "Putting Land to Safe Use Through Zoning."

A panel discussed "How the Wisconsin Chapter of the Soil Conservation Society can help you in your work and how you can help it."

E. O. Baker of the State Soil Conservation Committee discussed the "Watershed Approach". A panel of teachers from Pierce and St. Croix Counties told of techniques they had used in the schools. After dinner, in the college cafeteria, Lonetta Sublett reported on the annual meeting in Jacksonville, Florida.

Dr. Kleinpell, president of the College, gave the address of the evening session.

Sponsor A Fellowship Conservationist

Soil conservationists are now located throughout the world. The Society has a membership in about 45 countries. Additional conservationists in other countries are interested in the JOURNAL OF SOIL AND WATER CONSERVATION, but are unable to join because of finances, many of ther are students.

The national office has developed a list of capable, young conservationists deserving of membership in the Society, or who might be willing to exchange publications with present members. The list at the present time has names from New Zealand, Pakistan, Ceylon, Iran, Venezuela, Portugal and Greece.

1955 Committees Announced by President

Annual Meeting Program
R. G. HILL, *Chairman*
412 Agriculture Hall
East Lansing, Michigan
RUSSELL B. ALDERFER
O. J. ATTOE
REECE L. AYERS
T. B. CHAMBERS
MELVILLE H. COHEE
CHARLES A. DAMBACH
ADRIAN C. FOX
PAUL C. MCGREW
WILLIAM S. SWINGLE

Annual Meeting Local Arrangements
I. O. HEMBRE, *Chairman*
Agricultural Hall
University of Wisconsin
Madison, Wisconsin
WALTER J. KOHLER, *Co-chairman*

Archives
THOMAS S. BUIE, *Chairman*
Box 417
Columbia, South Carolina
PAUL TABOR
FRANK H. MENDELL
FRANCIS DWYER

Awards
HERBERT A. HOPPER, *Chairman*
817 10th Street
Sacramento, California
WARREN C. HUFF
T. H. LANE
MORRIS E. FONDA
FLOYD HEFT
HARRY R. SLAYBACK
FIRMAN E. BEAR

Basic Objective and Overall Philosophy
J. K. VESSEY, *Chairman*
U. S. Forest Service
Federal Building
Missoula, Montana
CHESTER S. WILSON
PHILIP F. ALLEN
E. H. GRAHAM
LLOYD E. PARTAIN

Business and Organizations Relations
HOWARD F. BARROWS, *Chairman*
Austin-Western Co.
Aurora, Illinois
KENNETH B. HUDDLESTON
J. C. BURTON
L. G. SAMSEL
CHESTER S. WILSON
JOHN R. TAYLOR, JR.
MINOTT SILLIMAN, JR.
C. R. GUTERMUTH

Chapter Activities
JOHN GRANT, *Chairman*
Peoples Building
Fairmont, West Virginia
H. C. FLETCHER
T. W. EDMINSTER
TOM J. WILKINSON
W. J. ENDERSBEE
W. THEODORE HEBEL
ELMER A. TAYLOR
CHARLES B. AHLSON
ORRIN J. HENBEST
P. H. MONTGOMERY
RAY W. CHAPIN
CHARLES M. HOOD

Election
H. L. CRITTENDEN, *Chairman*
823 Walnut
Des Moines, Iowa
OWEN CRIST
HERB H. PLAMBECK

Fellows and Honorary Member
RALPH H. MUSSER, *Chairman*
Soil Conservation Service
Washington, D. C.
RICHARD E. MCARDLE
DONALD A. WILLIAMS
R. Y. BAILEY
LLOYD E. PARTAIN

Finance
J. S. RUSSELL
Register & Tribune
Des Moines, Iowa
J. SELBY YOUNG
W. H. KIRCHER
HOWARD R. BISSLAND

Spanish Glossary
WILLIAM H. GRACIA, *Chairman*
Box 4671
San Juan, Puerto Rico
J. A. BONNET
JUAN P. CORDOVA
JOSE A. GONZALEZ SALDANA
JAIME BAQUE
JOAQUIN F. MARRERO
MANUEL PEREZ GARCIA

Membership
HAROLD M. RHODES, *Chairman*
RFD 5
Morgantown, West Virginia
VAL W. SILKETT
GEORGE L. WINCHESTER
(Plus a representative from each chapter)

Nominations
ADRIAN C. FOX, *Chairman*
P. O. Box 592
Bismarck, North Dakota
JAMES W. KIMBALL
EVAN HARTMAN

Organization and Policy
ROY D. HOCKENSMITH, *Chairman*
Soil Conservation Service
Washington 25, D. C.
ALVIN C. WATSON
EVAN L. FLORY
W. W. PATE
BRUCE B. CLARK

Personnel
J. S. RUSSELL, *Chairman*
Register & Tribune
Des Moines, Iowa
GEORGE M. BROWNING
AUSTIN L. PATRICK

Program
JACK L. BARRICK, *Chairman*
227 West Pike Street
Clarksburg, West Virginia
CLARK GLEASON
LINDO J. BARTELLI
GLENN RULE
JOHN F. SCHRUNK
VIRGIL B. HAWK
JOHN S. SMITH
LEONARD S. SILVER
K. C. BENNETT
EVAN D. BOLTON
LESLIE A. JACOBSEN
GEORGE N. JORGENSEN, JR.
W. MARION ROBERTS

Resolutions
CLYDE SPRY, *Chairman*
Secretary of Agriculture
State House
Des Moines, Iowa
H. G. BOBST
GLADWIN E. YOUNG
BERNARD FRANK

Student Chapter
ROY P. MATELSKI, *Chairman*
Agronomy Department
University of Nebraska
Lincoln, Nebraska
WENDELL R. TASCHER
J. F. MILES
WARREN C. BOURDETTE
RICHARD A. WIESE
MICHAEL F. BREWER

Joint Committee on Grassland Farming
B. D. BLAKELY, *Representative*
Soil Conservation Service
Washington, D. C.

National Conference on FAO
GEORGE W. HEDDEN, *Representative*
Bureau of Indian Affairs
Interior Building
Washington, D. C.

Natural Resources Council of America
E. H. GRAHAM, *Representative*
Soil Conservation Service
Washington 25, D. C.

Inter-Society Relationships
E. H. GRAHAM, *Representative*
Soil Conservation Service
Washington 25, D. C.

Technical Committees
WALLACE MITCHELTREE, *Chairman*
Soil Department
Rutgers University
New Brunswick, New Jersey

(A complete listing of technical committees and the annual meeting local committee will be made later.)

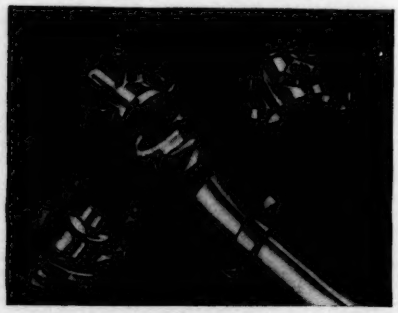
New Coupler

(*Continued from page* 154)

working pressure of 60 pounds with a 50 per cent safety factor. This simplified design was the result of exhaustive field and laboratory tests, and is responsible for the new, low price.

The "bolt-on" designed of the DeLuxe PORT-ALUM line has been incorporated to permit independent replacement of either pipe or coupler in the event of damage.

Pipe and coupler are connected by inserting the pipe in the coupler and making a half turn. No tools, hooks or clips are required. A double neophrene gasket expands under the slightest water pressure to provide a seal that is flexible enough to follow land contours without leaking.



New Portable Electric Pump

Spring and early summer rains are scheduled to provide crops with much-needed moisture this year, but too much rain can be a problem by collecting in cellars, outbuilding floors, annoying yard puddles or by saturating the soil around septic tanks and drain fields. To help solve this problem, a Minneapolis pump manufacturer is marketing a portable pump weighing only 26 pounds, complete with motor, hinged carrying handle and a vacuum switch that permits untended operation. Vacuum switch guards against burned out pump impeller by automatically stopping the motor when the liquid supply runs dry. Capacity is up to five gallons per minute with pressures up to 30 pounds, and it handles clean or dirty water with a minimum of clogging. Lifting water up to 10 feet unprimed or 22 feet primed, the pump has outside threaded ports for standard female garden house couplings. The pump features a hollow shaft that slips directly on to the motor shaft, eliminating the need for a base plate or special coupler. Motor is ¼-H.P., 110-volt, heavy duty capacitor type with manual reset overload protector and five-foot cord. For additional details, write Hypro Engineering, Inc., Dept. KP, 700 39th Ave. N.E., Minneapolis 21, Minnesota.

Have You Secured A New Member?

Dr. Patrick, president, recently mailed a letter to all members of the Society asking their cooperation in a concerted effort to increase the membership. As reported in previous issues it is hoped to increase the membership to allow for expansion of Society services. Your cooperation in securing additional memberships will be appreciated.

Watershed Interest

Somerville, Tenn.
March 24, 1955

Dear Sirs:

Am enclosing a membership application for Homer Smith, president of our Tri-County District local watershed group.

The watershed treasurer is paying for this membership and the JOURNAL will be routed to all watershed officers of three districts then to watershed membership. Outstanding articles from the JOURNAL are used for reports at monthly meetings by the officers. It is hoped that other watersheds will do likewise.

E. A. Owen

P. S.: Please send me five or six application blanks.

"Never forget this, there will always be more people, but there will never be more land."

—Henry Miller

The "strip" that clothes the land

Strip crop planting. Grassland farming. Contour cultivation. Terracing. Crop rotation.

These and many other conservation safeguards today are "clothing" our farm lands with soil-saving legumes and planned water protection . . . against the ravages of wind, water runoffs, blistering drought. Yes, against *erosion* . . . which, tragically, has already bled the vital topsoil from a terrifyingly vast area of our once usable resources.

Planned conservation not only protects and improves the land. It also helps *restore* land once thought unusable . . . so that it can again be sown with crops or made lush for grazing.

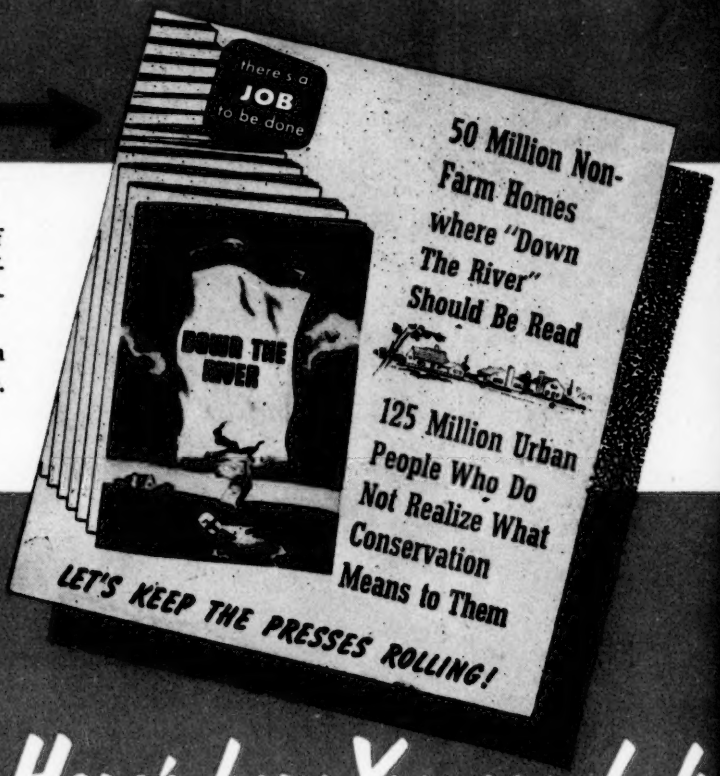
Ferguson and its Dealers stand ready as always to help *you* save the face of the land. First, by participation in community programs stressing the *need* for soil conservation. Second, by providing the "years ahead" mechanized equipment needed to implement those programs.

go years ahead / go

FERGUSON

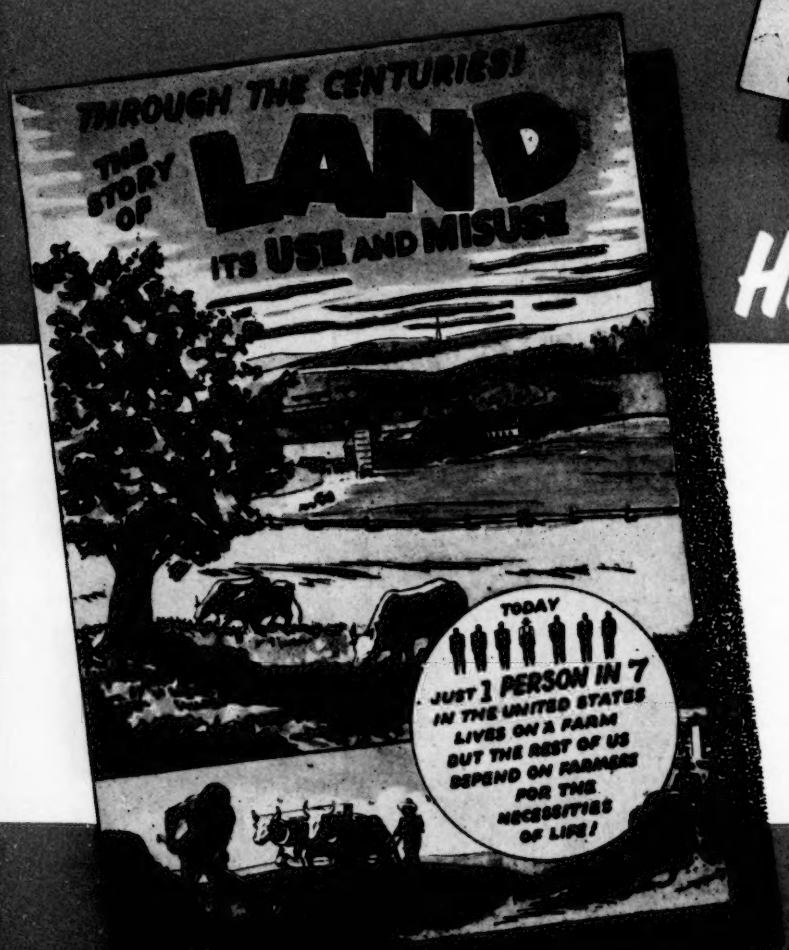
Now Let's Finish the Job

In the [illegible] issue of this Journal we said —>


there's a JOB to be done
DOWN THE RIVER
50 Million Non-Farm Homes where "Down The River" Should Be Read
125 Million Urban People Who Do Not Realize What Conservation Means to Them
LET'S KEEP THE PRESSES ROLLING!

. . . and "Down the River" has done a job—to the tune of half a million copies with several million readers—thanks to the efforts of many Chapters of the Society, hundreds of Soil Conservation Districts and dozens of individual Society members.

With its more conservative treatment of the subject, "Down the River" will continue to appeal to many groups of people. Don't sell it short!



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Society headquarters at Des Moines will gladly send you additional information or material.

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Road Rollers · Hydraulic Cranes

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